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CATECHISM OF THE LOCOMOTIVE.

By M. N. FORNEY, Mechanical Engineer.

PART XXVII.**ACCIDENTS TO LOCOMOTIVES.**

QUESTION 492. What are the most serious accidents which may happen in running a locomotive?

Answer. The most serious accidents are :

1. Collision of two trains approaching each other.
2. Collision of a moving with a standing train.
3. Collision of trains at the crossing of two railroads.
4. Running a train into the opening left by an open draw-bridge.
5. Escape of an engine without any one on it.
6. Running off the track.
7. Explosion of the boiler.
8. Bursting or rather collapse of a flue.
9. Blowing out of a bolt, stud or rivet from the boiler.
10. Failure of the feed-pumps, injector or check valve.
11. Breaking or bursting of a cylinder, cylinder-head, steam-chest, or steam-pipe.
12. Breaking or getting loose of the piston or cross-head or bending of the piston-rod.
13. Breaking or bending of a connecting rod or crank-pin.
14. Breaking of a tire, wheel or axle.
15. Breaking of a spring, spring-hanger or equalizer.
16. Breaking of a frame.
17. Breaking or getting loose of a part of the valve-gear.
18. Failure of the throttle-valve.
19. Breaking of a coupling.

QUESTION 493. What should be done to prevent a collision when two trains are approaching each other?

Answer. The obvious thing to do is to stop the trains as soon as possible. This is done by applying the brakes at once with all their power, and then reversing the engine, although it is best not to do the latter until the speed of the train is somewhat checked, as there is always danger of bursting the cylinder or breaking the cylinder-heads, piston or connections if an engine is reversed suddenly at a high speed. Of course the higher the speed, the greater is the danger of injury from this cause, and therefore it is best, if there is time, first to check the speed of the train before reversing the engine. When the engine is reversed, the sand valves should be opened so as to increase the adhesion of the wheels, so that when their motion is reversed they may check the speed of the train as soon as possible. On perceiving danger ahead the order of procedure should be as follows :

1. Shut the throttle-valve.
2. If the train is equipped with hand brakes alone, blow the danger signal for their application, or if the train has a continuous brake, apply it with its full force.

3. Reverse the engine and open the throttle and the sand valves.

4. If a collision is inevitable, shut the throttle-valve before the engines meet, because if it is left open, after the collision and when the speed of the train is checked, the engine, if not disabled, will by its own power crush through the wreck and thus do additional damage.

QUESTION 494. What should be done if a standing train should see another train approach it and there should be danger of a collision?

Answer. The locomotive runner of the standing train should start his engine in the same direction as the approaching train is running, as quickly as possible, because the shock of the collision will be very much lessened if both trains are moving in the same direction compared with what it would be if one was standing still.

QUESTION 495. What should be done to avoid a collision at a railroad crossing?

Answer. As was explained in answer to Question 475, trains should always come to a dead stop before crossing another railroad on the same level. If, however, through any means danger of such a collision should be incurred, then evidently the one train should be stopped and the other moved out of the way as soon as possible.

QUESTION 496. How can an accident by running into a draw-bridge be avoided?

Answer. First by **ALWAYS** coming to a dead stop before reaching it, and second by not starting again until it is absolutely certain that the draw is closed. Of course if a locomotive runner of an approaching train finds a draw open, the only thing he can do is to stop as soon as possible.

QUESTION 497. What measures should be taken to prevent locomotives from escaping without a responsible person on them?

Answer. In the first place when a locomotive is left standing the throttle-valve should always be **closed** and **fastened**, the cylinder cocks should also be opened so that if any steam leaks into the cylinders it will not accumulate there, but will escape, and the reverse lever should be placed in the center of the sector, so that if by any accident the throttle should be opened the engine will not start.

QUESTION 498. If a locomotive should escape, what should be done, and how may it be captured?

Answer. The first thing to be done is to telegraph to the stations towards which the escaped engine is running, either to keep the track clear, or, if there is a train approaching, to open a switch and thus let the engine run off the track. An

escaped engine may be captured by a swifter engine following it, but this is always attended with great danger, as the first engine may leave the track or become wrecked. A safer plan is to telegraph ahead of the escaped engine and have an engine placed in a position where the track can be seen for a long distance in the direction in which the runaway is expected. As soon as the latter comes in sight, the waiting engine should start in the same direction, so that when they get near to each other they will both be running in the same direction and at nearly the same speed. By regulating the speed of the front engine, the following one may be allowed to come up to it quite gently, and then a man can easily climb from the one engine to the other, and thus both be stopped.

QUESTION 499. What should be done in case an engine gets off the track?

Answer. The first thing to do is to close the throttle-valve and "signal for brakes,"* or apply the continuous brakes if the train is equipped with them, and then reverse the engine. If its position after it stops is much inclined, it is generally necessary to draw the fire to prevent injury to the heating-surface, a part of which is then usually exposed to the steam, and therefore not covered with water.

QUESTION 500. How is a locomotive replaced on the track in case it gets off?

Answer. It is impossible to give any directions for replacing locomotives on the track which will meet the great variety of circumstances which occur in practice. If the engine has not run far from the rails, it can usually be run on again by placing blocks of wood under the wheels and thus running them up to their proper position, but if the engine falls on its side or runs down an embankment, it is usually necessary to send for the appliances which are now provided on nearly all roads for removing wrecks and replacing engines on the track. These appliances are generally stored in what is called a wrecking or tool car, which is placed at a convenient point on the road from which it can be sent to any place where its services are likely to be needed. Such cars are generally provided with ropes, jack-screws, chains, crowbars, levers, etc., to be used in such cases, and generally a special set of men is sent with the wrecking car to direct and assist in replacing engines and cars on the track. It would lead us too far to describe all the methods of doing this employed under various circumstances; and as such work seldom forms part of the duties of a locomotive runner, a complete description would be out of place here.

QUESTION 501. After an accident which disables the engine, what is the first thing to do?

Answer. The first thing to do is always to "protect the train;" that is, to send out signal men in each direction to stop approaching trains; otherwise they might run into the wrecked train, and thus cause a double accident.

QUESTION 502. What is the chief cause of boiler explosions?

Answer. The cause of all boiler explosions, as happily expressed by a prominent American engineer,† is THAT THE PRESSURE INSIDE THE BOILER IS GREATER THAN THE STRENGTH OF THE MATERIAL OUTSIDE TO RESIST THAT PRESSURE. This may occur in two ways: first, and most frequently with locomotives, from insufficient strength of the boiler to bear the ordinary working pressure; and second, from the gradual increase of heat and pressure until the latter is greater than the boiler was calculated to bear.

Insufficient strength may be due: 1, to defects of the original design, owing to the ignorance of the strains to which the material of the boiler will be exposed and its power of resistance; 2, to defective workmanship and material, which can usually be discovered by careful inspection; 3, to the reduction of the original strength of the boiler by ordinary wear and tear or neglect, which can also usually be discovered by careful inspection.

The first two causes have been fully discussed in the part relating to boiler construction, and the last under the head of inspection of locomotives.

Over-pressure is nearly always due to some defect of the safety-valve, or to the fact that it is overloaded. This latter often occurs when safety-valves are set by a defective steam gauge, which indicates too little pressure. Over-pressure may also occur by letting an engine stand alone with a large fire in its fire-box and possibly with the blower turned on.

A boiler may, by suddenly opening the throttle-valve, undoubtedly be subjected to very severe strain that may possibly be sufficient to cause its destruction even though it had sufficient strength to bear the ordinary pressure at which the safety-valve blows off. Suddenly opening or closing the throttle valve may produce a violent rush of steam and water against the part of the boiler whence the steam is drawn. The percussion of the water and steam in such cases has been known to shake the whole boiler, and to lift the safety-valve momentarily right off its seat.‡ The weakest parts of a locomotive are the two sides where the barrel joins the outside fire-box. Many boilers, especially those with a high wagon-top, have flat spaces at this point, which it is impossible to stay properly. It is at this point too that the expansion and contraction of the tubes and the outside shell exert their greatest strains, and it will therefore be found, generally, that the seams at this point begin to leak before any others, and for these reasons it is believed that all the seams which join the outside shell of the fire-box to the barrel should be double-riveted.

The practice of ascribing steam-boiler explosions to obscure causes has been productive of much mischief, as it engenders a carelessness on the part of those having charge of them, who have been led to believe that no amount of care will avail against the mysterious agents at work within the boiler. Explosions are also, in the absence of other convenient reasons,

* This expression means, among railroad men, to signal to brakemen by blowing the whistle to have them apply the brakes.

† See Fifth Annual Report of the American Master Mechanics' Association, page 196.

‡ Wilson on Boiler Construction.

very generally attributed to shortness of water. This is often nothing more than a convenient method of shifting the responsibility from the builder or owner of the locomotive to the runner or fireman, who, if not killed by the explosion, in many cases might just as well be, so far as his ability to defend himself is concerned.§

QUESTION 503. What should a locomotive runner and fireman do to avoid and prevent explosions?

Answer. 1. The height of the water in the boiler should always be maintained so as to cover the heating surfaces. 2. The boiler should be kept as clean, that is, as free from scale, mud, and other impurities, as possible. 3. It should never be subjected to strains from sudden heating or cooling. 4. The steam-gauge and safety-valves should be examined and tested frequently, to be sure they are in order; and 5, they should examine every part of the boiler which is accessible, but especially the stay-bolts, to see that there is no fracture of any part or any injurious corrosion or other dangerous defect.

QUESTION 504. What should be done in case of the bursting or collapse of a tube?

Answer. As soon as possible after it occurs, the runner must stop the train, and close first the end of the flue in the fire-box and then that in the smoke-box, by driving in iron plugs, which are usually provided for the purpose. These plugs are attached to the end of a bar, with which they are inserted into the tubes. If the escape of water and steam from the tube is so great as to make it difficult to see the end of the tube, the steam may sometimes be drawn up the chimney by starting the blower. If, however, the escape is so great as to make it impossible to insert the plug, then the steam pressure must be reduced by running with both pumps on, or by starting the injector; or it may be necessary to draw the fire and cool off the engine. When a flue collapses the front end of which is behind the steam or pet-coat pipes, it is usually necessary to cool off the engine before a plug can be inserted, especially if any considerable amount of water and steam escape from it. While driving in the plug, the runner and fireman should always keep themselves in such positions that the plug cannot hit them in case it is blown out by the steam. If the engine is not supplied with iron flue-plugs, a wooden plug can be cut of the proper size and driven in. This can be attached to the bar referred to and inserted; but if no such bar is carried with the engine, the wooden plug can be made on the end of a long pole and then cut nearly off. It is then inserted into the flue and driven in and broken off. It will be found that such plugs will burn off even with the end of the flue, but will not burn entirely out.

QUESTION 505. What should be done in case a bolt, stud or rivet blows out of the boiler and thus allows the steam or hot water to escape?

Answer. If it is accessible, cut a plug on the end of a long pole and drive it in in the same way as described above. This will avoid the necessity of cooling off the engine; but in some cases it will be found that a plug cannot be inserted or driven in without drawing the fire and cooling off the boiler.

QUESTION 506. In case it is found necessary to draw the fire and cool off the boiler, and if so much water has escaped as to uncover the crown plate, what must be done?

Answer. If the leak has been stopped or the fault remedied, one of the safety-valves should be taken off and water poured into the boiler with pails or buckets through the opening left by the removal of the safety-valve until the crown sheet is covered. The fire may then be kindled again and the engine complete its journey. When bituminous coal is used for fuel, the necessity for drawing the fire in case of accident may often be avoided by completely covering or "banking" the fire with fine coal which has been wet and closing the dampers and opening the furnace door, although the latter should not be done until the boiler is somewhat cooled. In this way the fire may be smothered and the boiler cooled without putting the fire out so that after the defect is remedied it will not be necessary to rekindle it.

QUESTION 507. What must be done in case of the failure of one or both of the feed pumps or of the injector or check-valve?

Answer. If one of the pumps fails the other one may be used, but the defect or obstruction to the first should be remedied as soon as possible, because the second may also fail. It will then be necessary to depend upon the injector alone, if there is one, for feeding the boiler. Only after all the appliances for feeding the boiler have failed and the water is so low as to be in danger of exposing the crown-sheet should the fire be drawn or banked, and the runner should then at once give the proper signals for warning and the protection of his train, and if he is unable to repair the pump or injector, he must send for aid to the nearest accessible point.

QUESTION 508. In case a pump fails, how should it be examined in order to discover the defect?

Answer. As explained in the answer to Question 448, the working of a pump is usually indicated by the stream which escapes from the pet-cock. If when this is opened steam and water escape, it is an indication that the check valve is not working properly. When this occurs hot water will escape if the pet-cock is opened when the engine is standing still, but the pump may still feed the boiler if the upper or pressure valve works properly. When the check valve does not work as it should, it is also indicated by the heating of the feed-pipe, owing to the escape of hot water from the boiler through the check valve when the pet-cock is opened. If when the plunger is drawn out of the pump air is sucked in through the open pet-cock, then the upper or pressure valve of the pump does not work, but the working of the pump may still be secured by the working of the check valve; but if the pump, air-chamber and feed-pipe then get filled with air the plunger may compress this air at each stroke, and as it can then follow the plunger during its outward stroke, the latter will not suck water, but will simply compress the air during the inward

§ Wilson on Boiler Construction.

stroke, which will then expand during the outward stroke. This will be indicated by the escape of air from the pet-cock when the plunger is moving inward, and the suction of air when the plunger is moving outward. This can be known by holding the hand in front of the pet-cock. If air escapes from the pet-cock during the inward stroke of the plunger, but none is sucked in during the outward stroke, it shows that there is a leak somewhere in the pump or pipes, and that it is pumping air instead of water. The leak may be in the stuffing-box of the plunger, the joints of the pump or pipes, in the hose or their connections with the supply pipe or tender. If neither air nor water escapes from the pet-cock during the inward stroke of the pump plunger, or, if the stream of water at that time is weak, then it indicates that the suction or lower valve of the pump is not working properly. The same thing will occur if the pipe, pump or tender valve are obstructed. If there is a cock, as there always should be, just above the suction valve, it will aid us very much to discover the fault when the pump will not work. If when this cock is opened cold water escapes from it, the fault is in the suction valve; if hot water, then it is the pressure and check valves which are leaky, obstructed or broken, and consequently the hot water from the boiler leaks back into the pump. In the absence of such a cock, the fault can often be discovered by feeling the pump barrel with the hand. If the pump cannot be made to work, and the fault is found to be in the lower valve, it must be taken out and examined; or if the fault is in the pipes, it can usually be easily remedied. If the pipes are burst with only a small fracture, it can usually be remedied by covering the aperture with canvas or rubber and wrapping twine around it tightly. The upper valve of a pump must, however, never be taken down without first being sure that the check valve is tight, because if it is not the person will be liable to be scalded in taking the pump apart.

- Directions for managing an injector, and also for taking care of pumps in cold weather have already been given in the answers to Questions 138 and 401.

QUESTION 509. What should be done in case of the breaking or bursting of a cylinder or cylinder-head?

Answer. The main connecting rod must be taken down on that side of the engine. The piston should then be moved to the front or back end of the cylinder and wooden blocks be placed between the guides so as to fill up the space between the cross-head and the end of the guide-bars and thus prevent the cross-head and piston from moving. The valve stem should then be disconnected from the rocker, and the valve moved to the middle of the valve face, so as to cover up both steam-ports. It must then be fastened in that position by screwing up one of the bolts of the stuffing-box of the valve stem, so as to make the gland bind against the valve stem. The train should then be run cautiously to the next station with the use of one cylinder. If the engine is not able to haul the train with one cylinder, then it should be uncoupled from the train and run to the first telegraph station or other point where the aid of a helping engine can be obtained or telegraphed for. In the meanwhile the train must be protected by the proper signals. Should the engine continue its journey with one cylinder, it must be started, if it should happen to be standing at the dead point, by pushing or by means of crow-bars. In so doing, however, the bars should not be put between the spokes of the wheels, as they may easily be caught in the wheels when the engine starts, and in this way the spokes be broken or the persons who are using the crow-bars be badly hurt.

QUESTION 510. What must be done in case a steam-chest or steam-pipe is broken?

Answer. If a steam-chest is broken a block of wood should be bolted over the mouth of the steam passage, so as to prevent the escape of the steam from the steam-pipe on that side. It will sometimes require considerable ingenuity to devise means of fastening such a block or blocks of wood so as to cover the mouth of the steam passage. As cylinders are now usually made, the blocks can be fastened by cutting them to the proper form and size, and then placing a thick block on top, and bolting the steam-chest cover down on top of it. If the cover is broken, a part of it may be used on a piece of plank with a few holes bored into it be employed instead. In some cases a piece of board can be bolted over the end of the steam-pipe. When the latter is broken, it should be taken down and a piece of board or plank bolted over the opening of the T-pipe to which the steam-pipe was attached. The engine can then be run with one cylinder as before, although usually in such cases it is not necessary to disconnect any other parts than the valve stem.

QUESTION 511. What must be done if a piston, cross-head, connecting-rod or crank-pin is broken or bent?

Answer. If the piston, cross-head or main connecting-rod is broken, the same course must be pursued as when a cylinder is broken. If a coupling-rod or a crank-pin of a trailing wheel is broken, then it is necessary to take down both the coupling-rods, but not to disconnect the main connecting-rods or their attachments, unless they are injured.

QUESTION 512. If one coupling-rod is broken or taken down, why must the other be taken down also?

Answer. Because if only one rod is used there is then nothing to help the cranks past the dead-points, so that if they are moving slowly when they reach these points they are quite as likely to revolve in one direction as the other. If they happen to turn in the reverse direction to that in which the wheels to which they are coupled are moving, then the crank-pins of one or the other pair of wheels are very liable to be broken or bent.

QUESTION 513. What must be done if a driving-wheel tire or driving-axle breaks?

Answer. If a tire on a main driving-wheel or the wheel itself breaks, the driving box of the broken wheel or tire should be held up by putting a wooden block under the box.

An ordinary American engine can then be run on three driving-wheels, but it must be run with the utmost caution. If the engine has more than four driving-wheels, there is usually less difficulty in running it, if one of the main wheels is injured, than if there are only four. But it is almost impossible to give directions which will be applicable to all the accidents of this kind that may occur to different kinds of engines. If none of the connecting-rods, crank-pins or crank-pin bosses are injured, it is not necessary to disconnect either side, but if the injury is of such a nature that the coupling-rod must be taken down on one side, the one on the other side must be taken down too. If the main crank-pin and connecting-rod are not disabled, both cylinders may be used even if one of the main wheels or tires is broken. But even if one side of the engine must be entirely disconnected, the engine may still be run with one cylinder and by driving one wheel. If a main axle breaks the engine can usually be run, but great caution must be exercised. In such cases, however, if assistance or a telegraph office is near where the accident occurs, it is usually best to send for assistance at once, rather than take the risks which attend the attempt to run an engine so seriously injured.

QUESTION 514. What must be done when a trailing or leading driving-wheel, tire or axle breaks?

Answer. Very much the same course must be pursued as was described in the previous answer, although it is generally less difficult to run with a trailing or leading axle broken than it is when the main axle has met with such an accident.

QUESTION 515. What must be done if an engine-truck wheel or axle breaks?

Answer. It is usually best to chain up the end of the truck frame over the broken axle or wheel to the engine frame and place a cross-tie across the other end of the truck frame between it and the engine frame, so that the weight of the engine may rest on the cross-tie. If a part of the flange or a piece of the wheel is broken out, the wheels should be turned around so that the unbroken part will rest on the rail, and they should then be chained or otherwise fastened so that they cannot revolve, and thus be made to slide on the rails and carry the weight of the engine in that way. The same plan is employed if a tender wheel breaks, but one end of a tender-truck frame must be chained up. It is usually necessary to place a cross-tie across the top of the tender, and fasten the chains to it.

QUESTION 516. What must be done in case a driving-spring, spring-hanger or equalizing-lever breaks?

Answer. As the breaking of a spring or spring-hanger may cause a more serious accident, the engine and train should be stopped as soon as possible after it occurs. If the hanger is broken and there is a duplicate on hand, it should be substituted in place of the broken one. If there is no duplicate, then the spring should be taken down, and a wooden block be placed between the top of the driving-box and the frame to support the weight which before rested on the spring. In order to insert this block, if it is a front spring which is broken, it is usually best to raise the engine with jack-screws or run the back wheels on inclined blocks of wood placed under each of the back wheels. This raises the weight off of the front wheels, and the block can then be inserted between the box and frame. If it is one of the springs over the back wheels which is broken, the front wheels should be run on the wooden wedges. Such wedges can soon be cut out of a cross tie with an axe, or by sawing a square stick of wood diagonally it will make two such wedges. The end of the equalizing lever next to the broken spring must be supported by inserting a piece of wood under it. This will usually be held securely by the weight which is suspended from the opposite end bearing the blocked end down on the block.

QUESTION 517. What should be done if an engine truck or tender-spring breaks?

Answer. Very much the same course must be pursued that is employed when a driving-spring breaks, excepting that usually the weight can be lifted off from a truck-box easier by placing a jack under the end of the truck-frame than by the method described. Usually, too, each of the truck-springs supports the weight on two of the wheels, so that the two boxes must be blocked up.

QUESTION 518. What must be done in case the engine-frame is broken?

Answer. Usually very little more need be done than to exercise more than usual caution in running, and to reduce the speed. Of course the breakage of a frame may disable the engine, but ordinarily in such accidents that is not the case.

QUESTION 519. How can it be known if an eccentric has slipped on the axle?

Answer. It is indicated at once by the irregular sound of the exhaust, or, as locomotive runners say, the engine will be "lame."

QUESTION 520. When it is known that an eccentric has slipped, how can it be learned which is the one that is misplaced?

Answer. This can usually be learned by examining the marks which should always be made on the eccentrics and on the axles. If no such marks have been made by the builder of the engine, the runner himself should make them, after the valves have been set correctly. If, however, there are no marks by which he can tell, he should place the crank on one side in one of the dead points, and open the cylinder cocks; then admit a little steam to the cylinder, by opening the throttle-valve slightly, and throw the reverse lever from full gear forward to full gear backward, and observe whether steam escapes all the time from the end of the cylinder at which the piston stands. Then repeat the operation with the crank at the other dead-point. If either of the eccentrics has slipped, it will cause the valve to cover the steam-port either at the front or back end of the cylinder, so that no steam will escape from the cock at that end. If the eccentrics are both set right, the valve will have more or less lead when the crank is at each of the dead-points, with the reverse lever in any position. If either of the eccentrics has slipped, then the valve will have no lead at one

of the dead-points of the crank, when the slipped eccentric is in gear. If, therefore, it is found that there is no lead to the valve when the forward eccentric is in gear, then it indicates that the forward eccentric has slipped, or if no steam escapes when the link is in back gear, that the back eccentric is displaced. It must be remembered that when an eccentric slips it increases the lead at one end and diminishes it at the other, so that to discover the fault the valves must be tested at each of the dead-points. The valves on each side of the engine can, of course, be tested in the same way.

QUESTION 521. When it is discovered which eccentric has slipped, how should it be reset?

Answer. If it has been marked, it is simply turned back so that the marks correspond with each other again. This is done by first loosening the set-screws, and, after the eccentric is turned to the proper place, tightening them up again. When an eccentric slips it is often caused by the cutting of the eccentric-straps, valve or other part of the valve-gear, so that these should always be examined to see whether they are properly oiled. If the eccentrics have not been marked, the valve may be set by placing the crank at the forward dead-point, and the reverse lever in the front notch of the sector and the full part of the forward-motion eccentric above the axle. Then admit a little steam into the steam-chest, open the cylinder cocks, and move the forward-motion eccentric slowly forward until steam escapes from the front cylinder cock, which will show that the steam port is opened and the valve has some lead. To set the backward-motion eccentric the crank is placed in the same position, but the reverse lever is thrown into the back notch and the full part of the eccentric is placed below the axle. Then move this eccentric forward until steam escapes from the front cylinder cock as before. In order to verify the position of the eccentrics the crank may be placed at the back dead-point and the reverse lever moved backward and forward, at the same time observing whether steam escapes from the back cylinder cock when the link is in back and forward gear.

QUESTION 522. What should be done in case an eccentric-strap or rod, or rocker arm or shaft, or the valve-stem breaks?

Answer. If an eccentric-strap or rod breaks, the broken rod and strap should be taken down, and the valve-stem disconnected from the rocker and the valve fastened in the middle position of the valve face, and the engine should be run with one cylinder only. The same course must usually be pursued if a rocker breaks. If the valve-stem breaks, it is not necessary to disconnect the link and eccentric-rods, but simply to fasten the valve in the center of the valve face.

QUESTION 523. If a link hanger or saddle, or a lifting arm should break, what may be done?

Answer. The valve-gear may be used on that side of the engine by putting a wooden block in the link slot above the link block, so as to support the link near the position at which it works the valve full stroke forward. Of course the engine can then be run in only one direction, and should therefore be run with the utmost caution. If, however, it should be necessary to back the train on a side-track, it can be done by taking out the wooden block and substituting a longer one, so that the link will be supported in a position near that at which it works the valve full stroke backward. These blocks must be fastened in some way, either with rope or twine, so that they will be held in their position when the engine is at work.

QUESTION 524. If the lifting shaft itself or its vertical arm, the reverse lever or rod, should break, what can be done?

Answer. If it is impossible to devise any temporary substitute or method of mending them, both links can be blocked up as described above.

QUESTION 525. In case the throttle-valve should fail, what should be done?

Answer. If such an accident occurs, especially if it happens about a station, it is attended with great danger. If it is found that steam cannot be shut off from the cylinders with the throttle-valve, then the reverse lever should be placed in the middle of the sector. If this does not prevent the engine from moving, the reverse lever should be alternately thrown into the forward and then into back gear, and at the same time every aperture, such as the safety-valve and heater cocks, should be opened, and every means be taken to cool the boiler as quickly as possible. The fireman should open the furnace door, close the ash-pan, dampers, and start the blower so as to draw a strong current of cold air into the furnace and through the tubes. At the same time the injector should be started and the fire drawn as quickly as possible. After the boiler is cooled, the cover of the steam-dome may be removed and the valve examined if the defect cannot be discovered in any other way. Of course if the accident occurs on the open road, the train must be at once protected by sending out signals in each direction.

QUESTION 526. What must be done in case a coupling breaks?

Answer. When a coupling between the cars or tender breaks, if the front end of the train is immediately stopped, there will be danger that the back end of it, which is broken loose, will run into the front end, and thus do great damage. As it always occurs when a coupling breaks that the signal bell in the cab is rung, the first impulse of a runner under such circumstances is to stop the engine. He should, however, be careful not to do so if on shutting off steam he finds that the train has broken in two, but should at once open the throttle in order to get the front end of the train out of the way of the rear end. The ease with which the speed of a train is arrested with continuous brakes has increased the danger of accident from this cause. Usually a runner learns by the sudden start of the engine that the train has separated, and when that occurs he should never apply the brakes.

QUESTION 527. If from any cause the supply of water in the tender becomes exhausted, what must be done?

Answer. It is best, if it can be done without risk of injury

to the engine, to run the train on a side-track and then draw the fire. If no water can be obtained near enough to supply the tender with buckets, help must be sent for; but if there is a well, stream or pond of water near, the tender can be partly filled by carrying water.

QUESTION 528. In case an engine becomes blockaded in a snow storm with plenty of fuel, but runs out of water, what can be done?

Answer. Snow should be shoveled into the tender and steam admitted through the heater cocks so as to melt the snow.

QUESTION 529. If a locomotive without an injector should be obstructed in a snow storm or in any other way so that it could not move and therefore could not work the pumps, what should be done in case the water in the boiler should get low?

Answer. The weight of the engine should be lifted off from the main driving-wheels and the coupling-rods disconnected from the main crank-pins, so that the main wheels can turn without moving the engine. These can then be run and the pump thus be worked. The weight can usually be most conveniently taken off from the main wheels by running the trailing wheels on wooden blocks, and thus raising up the back end of the engine.

QUESTION 530. If it is impossible, in a snow storm or in very cold weather, to keep steam in the boiler without danger, what should be done?

Answer. Draw the fire, blow all the water out of the boiler, empty the tanks, disconnect the hose and slacken up the joints in the pumps and injector so that all the water in them can escape, and thus prevent them from freezing up.

Contributions.

Crossing Signals.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of August 15 an article on "Railway Signals" is submitted for the consideration of those interested. As a locomotive engineer of a number of years' experience, I lay some claim to the aforesaid consideration.

There is not the slightest difficulty in trains passing crossings if they are manipulated simply by "ball or no ball," which can be operated for \$1,000 per year, where it takes two persons, or for a less sum when only one is employed. There are on the Susquehanna Division of the Erie road nine balls and two bridges operated by arms on each end by a watchman in the middle of the bridge, and these signals are considered a sure guarantee against accident, and are virtually so. Indeed there is only one objection to them (the balls)—in foggy weather. I have once in about ten years' running had to send my fireman ahead to climb the pole to make sure the ball was not up.

This thing of stopping heavy trains at every crossing, or indeed any trains, is all bosh, and an insult to the intelligence of men who have brains enough to run a locomotive. That Michigan affair would have been avoided by the Erie system: if when one or both engines had whistled for the crossing the signal-man had run up the ball or had left it down, then either the one or the other would have had the road and would have immediately known it, and the opposite party would have given his whole attention to stopping his train and would have had no other "impression" in his mind. On a prairie road an engineer told me he was running once, and there was nothing to tell when he was approaching a crossing but a pile of fence boards for a long while. One foggy night he watched anxiously for the boards when, "rumble" he went over the crossing at 25 miles per hour. The boards had been moved. Proper signals operated from a central point, 500 feet each way on each road (the pivoted arms with two lamps on) to show position—horizontal for one and dropped down for the other), and warning posts that will not run away into a fence as the boards did, are all that is required to make crossing places perfectly safe on prairie. The idea of issuing orders to compel an engineer to bring his train to a dead stop opposite a certain post never can or will be lived up to until the air or some other equally good brake is applied to every car in the train.

Now this idea of the watchman coming up to pilot the engineer over the crossing is particularly rich. Supposing two double-track roads cross, four trains arrive at a time; four men would have to be employed at a time, or the last one wait almost indefinitely to cross. This matter will be plain to any practical railroad man. "Official theory" looks very fine to some people, but let them figure up the expense of all these things and then the point will be plainer. "Simplicity is railroad economy as well as domestic economy." The starting of heavy trains is a costly affair, and nobody deprecates the foolishness of unnecessary stops so much as the engineer, who sometimes takes out a drawhead in starting, in his impatience at unnecessary delay. "The less delays trains have, the more uniform will be the speed." I suspect one reason that some roads are everlastingly getting into trouble with trains is because they make changes in engineers too often, either through changes in their superior officers or other causes. Engineers as a class have a greater care and responsibility on their minds than is realized by officials generally, and reprimands and punishments are often in excess of the offence, and have an effect many times quite the contrary from what is intended. A simple letter of reprimand to an engineer of sufficient intelligence to appreciate it will effect more than to suspend him from duty for two or four weeks. Any one can take the question home and try to imagine how it would work in his case.

I will not take further space except to note that at a blind crossing something like the semaphores, so as to make the handling of a heavy train easy by giving the engineer sufficient notice, is good. The article marked (b) is sound, and with the ordinary crossing at grade governed by ball or no ball,

the judgment of the best class of locomotive engineers is all that is required for safety.

AN ERIC ENGINEER.

Hydraulic Machinery.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Many of your readers, if not all of them, are aware of the important advances made in the introduction of hydraulic machinery, for many of the simpler uses or needs of the machine shop, or the boiler shop, and to those who are not thus informed it may fairly be said that this adaptation of a means so simple and yet so effective for transmitting power is worthy of careful attention.

It may also fairly be said that even though to many of your readers such devices or appliances present no features of value in their own particular field of duty, yet they deserve careful notice as containing the elements of usefulness, perhaps in some direction not at all apparent at first sight.

One of these appliances is the hydraulic rivetting machine which is particularly worthy of attention now that so great care is required of our boiler-makers in working up our already very perfect iron and steel plates.

Another quite new device is the three-cylinder engine, which may be run by water pressure, and which gives a motion almost like that of a perfect rotary engine, but with this difference that the three-cylinder engine seems likely to prove as durable in all its parts as the best of our engines of common form, which is more than can be said for any rotary engine.

It seems quite a fair question whether in designing a new boiler shop, or in re-arranging an old one, it would not be a wise economy to use hydraulic power quite exclusively, since for all the machines in which a reciprocating motion is required, it is quite practicable to get well approved hydraulic machinery and an engine that bids fair to become well approved at an early day for the bending rolls and other similar uses.

PITTSBURGH.

ANNUAL REPORTS.

East Tennessee, Virginia & Georgia.

This company owns a line from Bristol, Tenn., southwest to Chattanooga, 242 miles, with branch from Cleveland, Tenn., 25 miles east of Chattanooga, south to Dalton, Ga., 27 miles making 269 miles in all.

The property is represented by the following securities:

Stock and stock script (\$7.917 per mile)..... \$1,968,274
Funded debt (\$15,632 per mile)..... 4,204,900

Total (\$21,949 per mile)..... \$6,178,174

There has been no material change in the capital account during the year. There is no floating debt and the items of bills receivable for the sales of the Western North Carolina and Rogersville & Jefferson roads, and the cost of the Cincinnati, Cumberland Gap & Charleston road amount to \$456,659.80.

There has been no material change in the condition of or in the relations with connecting roads. The Alabama & Chattanooga, and the Selma, Rome & Dalton, remain in litigation and give this road very little business. The Morristown and North Carolina connection remains in about the same condition as a year ago, except that the board of directors, through the President, made a contract with the North Carolina Railroad Company, under which it agreed to pay this company the amount embarked in the North Carolina connection, and executed its promissory notes, with interest for the same; and the North Carolina Railroad Company further agreed to complete the connection to the State Line at Paint Rock, and this company agreed to build the five or six miles from the end of the Morristown road to the connection at Paint Rock, and the two companies bound each to the other for an equitable interchange in business traffic. The execution of this agreement has been delayed by litigation on the part of some of the stockholders of the North Carolina Company.

A sale has been made of the Rogersville & Jefferson Railroad, during the year, for \$25,000, to Major W. P. Elliott, and a lien retained on the road to secure the payment of the purchase money.

The earnings and expenses for the year ending June 30 were as follows:

	1874.	1873.
Passengers.....	\$328,812 24	\$439,062 84
Freight.....	706,408 22	856,772 44
Other sources.....	25,963 56	82,523 18
 Total earnings.....	 \$1,111,184 02	 \$1,378,358 46
Operating expenses.....	697,408 49	929,148 42
 Net earnings.....	 \$413,775 53	 \$449,210 04
Gross earnings per mile.....	\$4,131 00	\$5,124 00
Net " "	1,538 00	1,670 60
Per cent. of expenses.....	62.76	67.41

The decrease in earnings was \$267,196.67, or 19.39 per cent.; in expenses, \$231,729.93, or 24.94 per cent.; and in net earnings, \$35,466.74, or 7.89 per cent. The decrease was nearly uniform in through and local business. The decrease in expenses is due to a general reduction in salaries of employees, to a decrease in renewals and to strict economy generally.

During the year 22 miles re-rolled iron and 63,961 ties were used in renewals; 13½ miles ballasted with broken stone; 6 passenger and 60 freight cars rebuilt and 10 new freight cars added to equipments. The cost of these renewals (included in expenses) was \$175,613.09.

The net earnings are accounted for as follows:

Interest.....	\$280,007 99
Dividends.....	117,751 50
New passenger depot at Knoxville.....	10,884 84
Right of way.....	899 30
Balance to credit of profit and loss.....	4,237 90

\$419,775 53

Two dividends have been declared, each of 3 per cent., one of which was paid April 1, and the other will be paid October 1, 1874.

Connecticut & Passumpsic Rivers.

This company owns a line from White River Junction, Vt., northward to the Canada border at Derby Line, 110 miles, and it leases and operates the Mississippi Valley Railroad from Derby Line north to the Grand Trunk at Sherbrooke, P. Q., 35 miles, making 145 miles worked.

The property owned is represented as follows:

Stock (\$19,777 per mile).....	\$2,175,500
Bonds (\$8,181 per mile).....	900,000
Coupon notes (\$5,764 per mile).....	634,000

Total (\$33,722 per mile)..... \$3,709,500

The annual interest charge is \$104,415, or \$350 per mile. The floating debt is more than covered by money on hand and due and supplies on hand. The company holds \$350,000 Mississip-

& Clyde Rivers bonds and has a sinking fund amounting to \$133,000.

The earnings and expenses for the year ending June 30 were as follows:

	1874.	1873.
Passengers.....	\$267,488 27	\$287,110 53
Freight.....	445,760 69	484,045 43
Other sources.....	38,653 49	31,682 33
 Total earnings.....	 \$771,902 35	 \$820,839 29
Operating expenses.....	499,112 10	540,564 02

Net earnings..... \$272,790 25 \$262,275 27

Earnings per mile..... \$5,923 \$5,537

Net earnings per mile..... 1,881 1,809

Per cent. of expenses..... 64.66 67.33

The decrease in gross earnings was \$30,936.94, or 3.85 per cent.; the decrease in expenses, \$41,451.92, or 7.67 per cent.; the increase in net earnings, \$10,514.98, or 4.01 per cent.

The work of the year was as follows:

	1874.	1873.
Train mileage.....	458,662	508,859
Passenger carried.....	193,529	182,280
Passenger mileage.....	6,736,788	6,153,567
Tons of freight carried.....	153,343	158,428
Tonnage mileage.....	9,722,127	11,300,627

The increase in passenger mileage was 9.48 per cent., and the decrease in tonnage mileage 13.27 per cent.

The income account is as follows:

Balance from last year.....	\$118 54
Net earnings.....	272,790 25

Interest on bonds and notes and balance interest account..... \$80,592 62
Coupons on Mississippi bonds..... 26,547 80
Dividends..... 154,556 00
Sinking fund..... 8,000 00

Total \$229,908 79

Balance..... \$8,412 37

During the year 843 tons new rails and 51,424 new ties were used, and 6,945 rails taken up, repaired and re-laid. Nearly all the bridges were thoroughly repaired. The equipment was increased by one engine, two passenger cars and 17 road or service cars, and a number of cars were rebuilt.

Kansas Pacific.

This company owns a line from Kansas City, Mo., westward to Denver, Col., 638 miles, with a branch from Lawrence, Kan., to Leavenworth, 34 miles, a total of 672 miles. It owns a controlling interest in the Denver Pacific, from Denver, Col., to Cheyenne, 106 miles; the Denver & Boulder Valley, from Hughes, Col., to Boulder, 27 miles; the Arkansas Valley, from Carson, Col., to West Las Animas, 56 miles; and the Junction City & Fort Kearney, Junction City, Kan., to Clay Center, 31 miles; a total of 223 miles. The accounts of these lines are kept separately.

The property owned is represented as follows:

Stock (\$14,420 per mile).....	\$9,699,950
Funded debt (\$31,411 per mile).....	21,108,100
Government subsidy (\$9,373 per mile).....	6,300,000

Total (\$55,204 per mile)..... \$37,098,050

The changes during the year are an increase of \$51,000 in stock and a decrease of \$92,250 in funded debt.

The following statement of resources and liabilities at the close of the year is given:

Miscellaneous investments and assets.....	\$2,884,328.08
Cash.....	155,705.82
Material on hand.....	216,561.56
Bills receivable.....	364,252.87
Bills from United States (less 50 per cent. retained).....	163,587.41
Due from other roads.....	332,721.94

Total assets..... \$4,117,567.68

Bills payable and loans..... 2,684,365.10

Auditors' checks out..... 170,527.77

Audited accounts, pay rolls, coupons, etc..... 781,719.44

Due to other roads..... 51,093.97

Excess of assets..... 529,861.40

Total..... \$4,117,567.68

During the year 25,423.43 acres of the land-grant were sold for \$93,335.43. The total number of acres sold up to the close of the year was 833,363 for \$2,403,528.91. In the Kansas Pacific trust, the trustees had, up to the close of the year, received \$645,888.48 and redeemed bonds to the amount of \$248,250. There remained 1,790,174.53 acres unsold in this trust. In the Denver Extension trust there had been received \$179,151.26, canceled \$68,000 of bonds, and 2,967,560.98 acres remained unsold in the trust.

The earnings and expenses for the year ending December 31 were:

	1874.	1873.
Passengers.....	\$1,169,763 24	\$1,184,197 51
Freight.....	2,023,062 02	2,197,149 21
Miscellaneous.....	145,267 73	89,859 90

Total ordinary business..... \$3,358,083 99 \$3,471,200 62

Government business..... 205,265 50 252,512 56

Total earnings..... \$3,563,299 49 \$3,723,713 18

Operating expenses..... 2,116,990 59 2,229,165 77

Net earnings..... \$1,446,308 90 \$1,494,447 41

Gross earnings per mile..... 5,795 00 5,533 40

Net " " 2,149 00 2,224 00

Per cent. of expenses..... 59.41 56.86

This shows a decrease of \$160,413.69, or 4.31 per cent. in gross earnings; of \$112,275.18, or 5.04 per cent. in expenses; and of \$48,138.51, or 3.22 per cent. in net earnings.

The work done was as follows:

	1873.	1872.
Train mileage.....	2,114,496	2,475,270
Passenger carried.....	173,651	179,162
Passenger mileage.....	23,589,686	20,664,369
Tons of freight carried.....	265,405	348,966
Tonnage mileage.....	61,967,443	72,366,397

The increase in passenger mileage was 14.16 per cent.,



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Editorial Announcements.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proportion to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

REGULARITY IN DIVIDENDS.

The New York Central & Hudson River Company has taken a step which is likely to make its stock more popular as an investment for incomes, not only by deciding to make dividends quarterly, which is a good thing, especially for people who live on their income from dividends, and gives them the use of their money one half longer on the average, but also by declaring that the dividends shall be made of course; which is equivalent to saying that hereafter instead of requiring a vote of the board before paying dividends, dividends will be paid unless the board orders to the contrary. Of course the company will not be able to pay dividends unless it earns them, and it might be thought that this order of the board is mere blarney; but we think we can see a justification for it. We assume that it means that the board is convinced that the basis of the company's business is so solid and so little liable to great fluctuations that it can, under almost any circumstances likely to occur, pay a 2 per cent. dividend every quarter hereafter. And if, as is reported and is probable, the net earnings during this past year of panic and season of extraordinary dullness of business have been as great as last year's, and in excess of all interest charges and the 8 per cent. dividend, we think the board has good reason for such confidence.

In this connection it is worth while to call attention to the desirability of so managing the affairs of dividend-paying railroad companies as to render their dividends regular and certain. Too little attention is paid in this country, we think, to making railroad stocks desirable as an investment to those who need all their income for their expenses. If a company divides all of its income during a prosperous year and has nothing to divide when business is temporarily depressed, its stock is necessarily confined to those who have an independent income from other sources. It is almost sure to ruin a poor man to touch it. Now the consequence of this is that such stocks are chiefly held in considerable blocks by capitalists, who are, though in a perfectly legitimate way, and in a way absolutely necessary with all property of fluctuating value, speculators, they hold the property in hopes of an improvement in its value and its price which will eventually repay them for their sacrifice of income meanwhile. Now there is no possible objection to "speculation" of this kind. It is absolutely necessary to the conduct of most kinds of business. But with railroad companies it has the effect men-

tioned above, that of concentrating the holdings in the hands of a few capitalists, and preventing that generally spread and intimate knowledge of and interest in the property which would be felt if the stock were commonly held in the country through which the road runs by people who have but a few hundred or thousands of dollars of capital, and need the interest on that regularly. The unreasoning and unreasonable attacks made on railroads by those who know nothing of them and imagine them to be, as a whole, a sort of magnificent booty held by robbers who have virtually stolen them from the community, would be answered and silenced at the time of their origin if the farmers, mechanics and merchants who make them had for neighbors other farmers, mechanics and merchants holding and having held for some years the shares of some railroad. It is easy to get credence for exaggerated or baseless stories of the profits of the railroad we use if its owners live a great way off, in Amsterdam, London or Boston; and the stories may hardly be denied, or denied after they have had their effect, and people are not ready either to hear or to believe the denial. We venture to say that if the shares of the leading Western railroads were held wholly or chiefly by people along their lines, and had been from the beginning, there would have been no possibility of the prevailing hostility, any more than of general hostility between farmers and mechanics or farmers and merchants.

Now it would not have been possible for this to have been the case. A new railroad is almost always and necessarily an uncertain investment, which can only be made out of capital which need not earn an immediate income, and so must be the property of capitalists who seek to increase their fortunes by it in the course of years, but can live without any income from it for a considerable period at least. Small investors who need their eight or ten dollars per hundred every year to pay for rent, provisions or clothing have no business with such property. But when a railroad company has reached that degree of prosperity that it has something to divide among the shareholders every year, then it will be an advantage to the community and to the railroad interest if its securities become a favorite investment in the country along its line; and to become a favorite investment great pains must be taken to make the dividends regular and certain. The bonds will be safe, of course, long before the stock; but bondholders are by no means so identified with the company's interests. To secure such regularity and certainty, we believe it to be well to consider the suggestion which we made last week, to provide a fund from the earnings of prosperous years which may serve to tide over any season of disaster: in a word, not to divide all the surplus earnings, if these be large, but to save something for the inevitable rainy day.

Another advantage to a company of numerous shareholders along its line is the constant inspection by the latter of its property and the conduct of its business. The average shareholder is a very poor inspector, it is true, but he could at least see the flagrant abuses that sometimes occur and become notorious, and would be likely to report them, and, moreover, his reports would be likely to be attended to. He would not see a score of locomotives rusting on sidings all winter without grumbling; and if a contract was made to supply a hundred thousand cords of wood at five dollars a cord, the ruling price in that vicinity being three dollars, the company would be likely to hear of it. And, too, the company or its agents could not do injustice to the community, no more than the community to the company, without calling forth a protest from these shareholders, who are at once members of the company and of the community also.

It is not necessary that all or even most of a company's shares should be owned in the community which it serves in order to secure these desirable influences. A sprinkling of shareholders among the people, and especially among the small capitalists, would do much to create something like a community of feeling between the public and the corporation; a disposition to recognize each other's rights as well as duties, and to rejoice in the prosperity of the railroad as a part of the prosperity of the community—a condition of things that rarely exists now, we fear.

There is a tendency, and a deplorable one we are sure, to take advantage of seasons of temporary prosperity to inflate the prices of shares. A young company with a growing property which had before earned no more than 6 per cent. on its shares may during some prosperous season return a surplus equal to 10 per cent. Now the shareholders may very likely make more money than in any other way possible by declaring such a dividend and selling their shares at the inflated price caused by the impression that such dividends will be earned ever after. If the earnings fall to their old level, those of the new buyers who cannot hold their shares sell at a great sacrifice, and the others and their successors are likely to take advantage of the next prosperous season to sell out their shares at a high price. But this cannot last always. The property soon gets a reputation as a fluctuating one, and its average price is probably less than if the dividends were based on the earnings of a series of years instead of those of each separ-

ate year. Moreover, the property changes hands too frequently to have a stable and economical management. If a portion of the surplus of the first unusually profitable year had been reserved, the shares would not have risen so high, it is true, but neither would they have fallen so low with the rate of dividend afterwards, and they would have been held in large part permanently, and so secured a permanent management.

In its progress from a non-dividend to a dividend-paying condition a company has usually one and often many such experiences as we have noticed and regretted above. But when it is assured of a divisible surplus yearly, every effort should be made to render the dividend certain and as regular in amount as possible. And we believe that there is a tendency in this direction which is likely to grow with the stability of railroad companies.

THE PROBLEM OF THE WISCONSIN RAILROADS.

The decision of the Supreme Court of the State of Wisconsin in favor of issuing an injunction to compel the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul companies to obey the Potter law will compel these companies to reduce their rates to the schedule fixed by the law, after this month, and work their roads at these rates hereafter, unless the law should be held unconstitutional by the United States Circuit Court, which will try its case next month, or is repealed by the next Legislature, which latter, we fear, is little likely to be done if the law is held to be constitutional.

An examination of the past business of the companies and the effect on their receipts by the reductions made by the Potter law shows, we are told, that it would have reduced earnings by about 25 per cent., leaving, in the case of one company, much less than the amount required to pay the interest on its bonds; in the other, just about enough. Now, however, the earnings of both companies are much smaller than usual, even at the old rates, so that the net earning which would have been produced under the law by last year's traffic would have surpassed considerably those of this year. Therefore one certainly and both probably of these companies must become bankrupt, unless they can reduce their expenses enormously.

This problem of the reduction of expenses, therefore, is now a vital one with these two companies—two of the greatest in the world, with an aggregate of nearly 3,000 miles of road, though not all in the State of Wisconsin and affected by this law.

If it had been the problem with these companies to adjust their expenses to such rates when their roads were first constructed and equipped, it would have been a comparatively simple one, and might perhaps have been solved successfully, though to the permanent disadvantage of the State. The price being limited, the accommodations could have been limited to suit it, and then the question would have been to provide such a road and equipment as would carry passengers and freight at the stated rates, in any way and at any speed that might prove economical. Now for low speed the whole equipment, freight and passenger, could have been made probably fully one-third lighter, as is proved by the successful use of such light equipment at such speeds on local lines. But with such a reduction in the weight of equipment the weight of the rails and of all other superstructure could have been reduced and an immense saving made in the cost of the property, and therefore in the interest which it must earn, and another large saving in the current working expenses, by the great reduction in the gross weight to be hauled, by the reduction of speeds and by the simplification of traffic, either through conducting passenger traffic in mixed trains or an approximation of the speeds of freight and passenger trains, which would save the great cost of running the former fast to keep out of the way of the latter.

But this was not the problem presented to the builders of the Wisconsin railroads. The people wanted the accommodations customary in other States—elegant and costly coaches, fast speeds, frequent trains, quick deliveries of freight, shipments daily of small amounts from small local stations, necessitating numerous stops, etc. They received what they demanded. Now they express their unwillingness to pay for such accommodations, and the State courts affirm that they need not; but the companies having provided an enormous machine to do one kind of business are absolutely without the facilities for doing the other. They have not only the burden of the greater cost of the heavy road and rolling stock, but they are such road and rolling stock as cannot be used with economy for slow, cheap traffic.

We believe, therefore, that, whatever may be the success of these companies in reducing expenses by lessening the quality of the service, the cost to them will yet be extraordinarily high for service of that kind. It is possible to plow with race horses, but you cannot plow economically with them.

So the Wisconsin companies must continue to run coaches weighing from twelve to twenty tons and expensively fitted and adorned, even if they run but twelve or

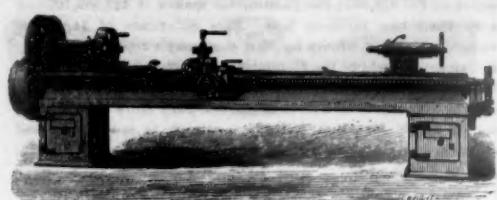


Fig. 1.
AXLE LATHE.

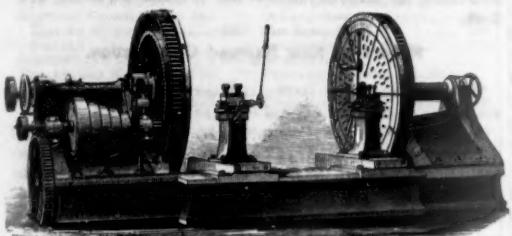


Fig. 4.
DRIVING WHEEL LATHE.

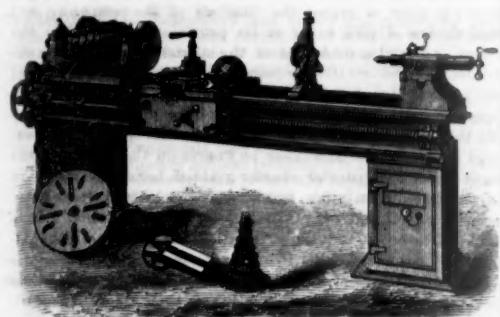


Fig. 7.
20-INCH ENGINE LATHE.

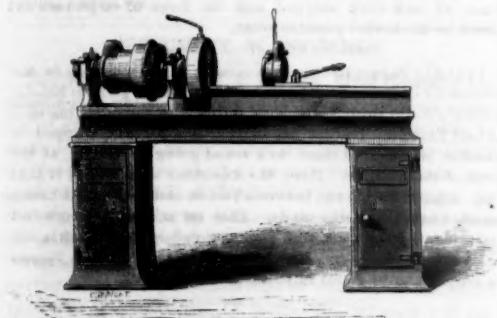


Fig. 9.
BOLT CUTTING MACHINE.

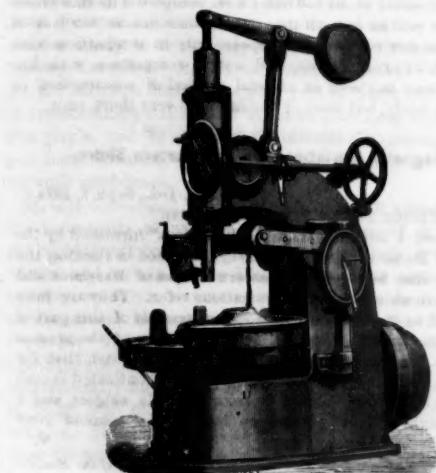


Fig. 12.
CAR WHEEL BORER.



Fig. 2.
RADIAL DRILL.

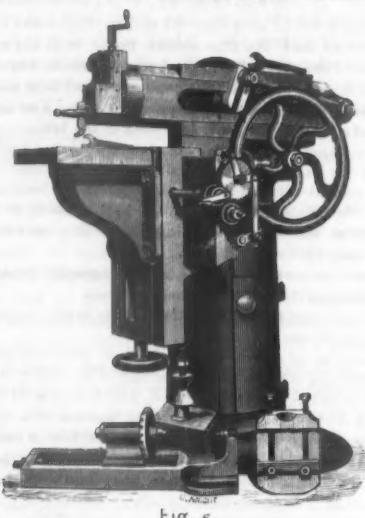


Fig. 5.
SHAPING MACHINE.

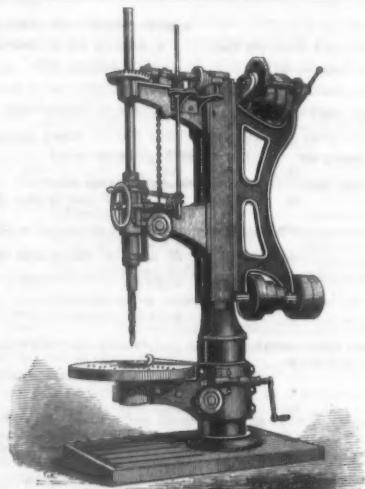


Fig. 10.
UPRIGHT DRILL.

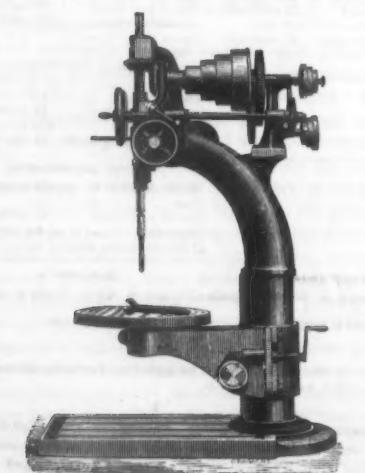


Fig. 13.
UPRIGHT DRILL.

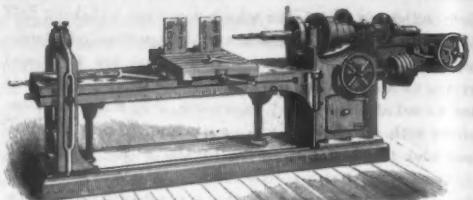


Fig. 3.
HORIZONTAL BORING MACHINE.

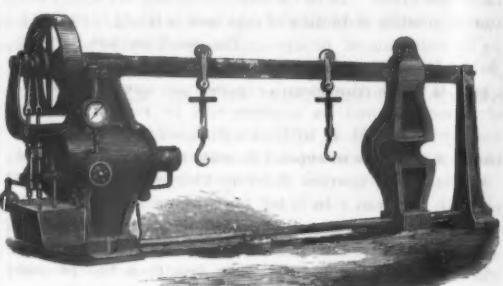


Fig. 6.
HYDRAULIC WHEEL PRESS.

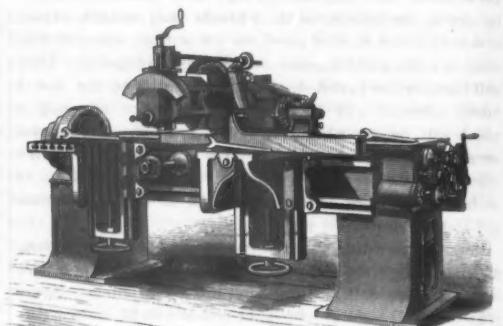


Fig. 8.
SHAPING MACHINE.

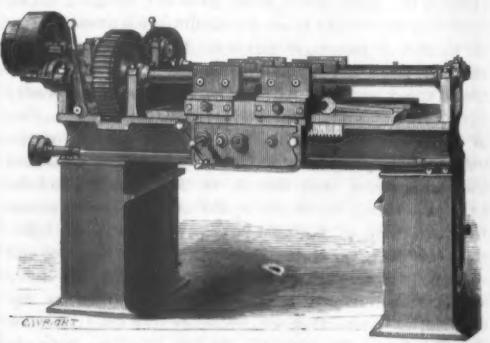


Fig. 11.
BOX BORING MACHINE.



Fig. 14.
SLOTTING MACHINE.

U.S.P.M.

MACHINE TOOLS,

BY THE NEW YORK STEAM ENGINE COMPANY, 98 CHAMBERS STREET, N.Y.

fifteen miles an hour, for which use cars weighing half and costing one-third as much would be perfectly suitable. They must use their freight cars weighing ten tons and carrying as many, when much lighter ones would carry as great a load at a less speed; moreover, they must use locomotives with a weight of five or six tons on each driving-wheel and terribly destructive to the rails, when with lighter cars and lower speeds the weight might be greatly reduced, and with it most of the expenditure for maintenance of rails.

The existing problem, then, is how to work the roads as they are so as to reduce the working expenses to the minimum by any necessary sacrifice of the accommodations heretofore given. To the minimum, we say, for we assume that no possible reduction of expenses is likely to make up for the reduction of receipts. The roads are not earning dividends now, and they have no surplus earnings to spare. If the Northwestern's expenses are now 70 per cent. of its receipts, and its receipts will be reduced 25 per cent. by the law, then, without a change in the manner of traffic, it will have to expend 70 cents for every 75 received—that is, the proportion of its working expenses will become 93½ per cent.; in order to continue to earn net 30 cents net on each transaction for which hitherto it has received gross one dollar, it must do that work for 45 cents, which is 25 cents, or 35.7 per cent., less than the present cost of doing the work. If the Wisconsin railroad men find any possible means of reducing their expenses to this extent, they will make a discovery important to the world as well as to themselves. We do not believe it possible. Do whatever they can, though they may possibly succeed in earning the interest on their bonds, they cannot expect to equal the earnings of previous years, themselves insufficient to make a fair income on the capital invested. They will therefore be justified, and if the validity of the law is finally affirmed, will be compelled to adopt any policy which will, on the whole, save expenses or increase net earnings, whatever may be the limitation of accommodations occasioned thereby. It is a question, as we have said before, of life and death to the companies, and justifies desperate remedies.

Now to determine the method of management which, under existing circumstances, will prove most economical, is an extremely delicate and complicated problem. Some reduction in the speed of freight trains might reduce certain expenses materially, but if trains run much slower than heretofore, there must be a great many more cars and locomotives, and how is a Wisconsin railroad company to get capital for additional equipment with this law in force? Passengers could be carried cheaply in mixed trains, and probably the passenger equipment would be more nearly equal than the freight to such a modification of its use; or the number of passenger trains might be greatly reduced and made large and to run slowly; but too great a reduction in speed and the frequency of trains might greatly lessen traffic and thus counterbalance the saving in expenses. Moreover, a considerable portion of the traffic of both companies is in through passengers to and from other states, and though the law cannot affect the fares paid them, the trains could not well be run across Wisconsin without taking a large amount of local traffic, or, in case the other trains are much inferior in speed and accommodations, perhaps most of it on the through lines. But if the companies lessen the accommodations for through passengers they will probably lose the traffic, for there is a very good route, or rather good routes, between Chicago and St. Paul which do not pass through Wisconsin, and these, which have almost none of the business now, would probably take most of it if the accommodations of the Wisconsin companies were much limited, though the Chicago, Milwaukee and St. Paul would still do the carrying in Minnesota, and the Northwestern most of that in Illinois, probably.

Thus we see that the companies, in attempting to reduce their expenses to the extent of the reduction of their receipts in the State of Wisconsin, have a task of extraordinary difficulty before them. If the United States Court affirms the validity of the law and it is not repealed, we fear that nothing can save them from bankruptcy unless their earnings in other States and on traffic from other States which the law does not affect will make good the deficiency on the Wisconsin lines. One of the companies has its most profitable traffic out of Wisconsin; the other has very little; both, however, have a large traffic passing through the State to and from adjoining States, and this will do something (if it can be kept profitable) to ward off disaster.

At this day, the stocks alone of these two companies have a market value more than *fourteen million dollars* less than in January last, besides a great decrease in the prices of the bonds, all of which may be regarded as a fine levied on the holders of these securities for daring to own Wisconsin property.

Trials of Atmospheric and Vacuum Brakes.

The interest which is taken in the relative merits of these two systems of brakes will secure the attention of many of our readers to the following tabular statement of experiments made with the vacuum brake on the Toledo,

Wabash & Western Railway, and with the Westinghouse automatic atmospheric brake on the Chicago & Alton Railroad. The first experiments were made to determine the time occupied: 1, in applying the full pressure of the brakes to the rear car of a train of 10 cars; 2, the time occupied in taking up the slack on the rear car; 3, time occupied in bringing the full pressure on the brake-shoes in the middle car; 4, time occupied in taking up the slack on the middle car; 5, time required to bring full pressure of the brakes on the forward car, and 6, time required to take up the slack on the front car.

The second trials were made to determine the time and distance in which the trains could be stopped. The trial with the vacuum brake was made on a level track and with the atmospheric brake on a descending grade of 24 feet per mile. The atmospheric brake was, however, applied to the driving-wheels of the engine, whereas the vacuum brake was not. Each train consisted of ten cars with four and six-wheeled trucks, as indicated in the "memoranda" below the table, from which it will be seen that the number of wheels under the cars of the train to which the vacuum brake was attached was 96, and the number under the atmospheric brake train cars was 108. As only four of the wheels of a six-wheeled truck have brakes, it will be seen that the vacuum brake was applied to 88.3 per cent. and the atmospheric brake to 74 per cent. of the weight of the cars. The speed was determined by taking the distance between the telegraph poles and then counting the poles and taking the time with a stop watch. The distance and time of stopping the train are given in the table.

The third experiment with the vacuum brake train was made with the hand brakes applied by five brakemen. In the third experiment with the atmospheric brake the brakes were applied to the whole train and engine by a passenger in the sixth car from the engine, the engine working steam until the train stopped.

The fourth experiment with the atmospheric brake was made by detaching the engine from the train.

In the fifth experiment the atmospheric brake was applied to the engine alone.

These experiments are interesting, chiefly from the fact that they indicate the amount of time occupied by each system in applying the full power of the brakes, which in case of danger is an element of very great importance, because at a speed of 35 miles per hour the train will run over 50 feet in each second, so that if ten seconds are lost in applying the brakes the train will have run 500 feet before they begin to check its speed.

Experiments with Smith's Vacuum Brake on the Toledo, Wabash & Western Railway, July 15, 1874, and with the Westinghouse Automatic Brakes on the Chicago & Alton Railroad, July 22, 1874.

VACUUM BRAKE. Toledo, Wabash & Western Railroad, July 15, 1874.		WESTINGHOUSE AUTOMATIC BRAKE. Chicago & Alton Railroad, July 22, 1874.	
FIRST EXPERIMENT With 10 cars.		FIRST EXPERIMENT With 10 cars.	
Time in seconds.		Time in seconds.	
Full pressure—rear car.....	19½	20½	
*Slack taken up—rear car.....	10	11½	
Full pressure—middle car.....	23½	22 1-5	
Slack taken up—middle car.....	9½		
Full pressure—forward car.....	12	20½	
Slack taken up—forward car.....	3	3½	
SECOND EXPERIMENT. Level track.		SECOND EXPERIMENT. Down grade 24 feet per mile. Brake applied to engine and whole train.	
Cars.....	10	Cars.....	10
Speed per hour.....	35 to 40 miles.	Speed per hour.....	35 miles.
Distance run.....	1,365 feet.	Distance run.....	.513 feet.
Time running same.....	.36 seconds.	Time running same.....	.17½ seconds.
THIRD EXPERIMENT.		THIRD EXPERIMENT. Brake applied to engine and whole train by passenger in 6th car from engine. Engine working steam until train stopped.	
Brakemen.....	5	Cars.....	10
Cars.....	10	Speed per hour.....	35 miles.
Speed per hour.....	35 to 40 miles.	Distance run.....	.592 feet.
Distance run.....	.975 feet.	Time running same.....	.17½ seconds.
Time running same.....	.30 seconds.	FOURTH EXPERIMENT. Engines detached from the train.	
Brake applied to engine only.		Cars.....	10
Cars.....	10	Speed per hour.....	35 miles.
Speed per hour.....	35 miles.	Distance run.....	.460 feet.
Distance run.....	.975 feet.	Time running same.....	.18 seconds.
Time running same.....	.30 seconds.	FIFTH EXPERIMENT. Brake applied to engine only.	
Memoranda.		Cars.....	10
Toledo, Wabash & Western train	consisted of: 4 cars, 6-wheel trucks.	Speed per hour.....	35 miles.
6 " 4 " "	7 cars, 6-wheel trucks.	Distance.....	.2400 feet.
	3 " 4 " "	Time running same.....	1 min. 10 sec.

* By taking up the slack is meant bringing up the brake-shoes until they are in contact with the wheels.

THE PENNSYLVANIA RAILROAD INVESTIGATING COMMITTEE has made a statement of the general account of the company which differs somewhat from that given by the board in its annual report, chiefly in the valuation given of the company's holdings of the stocks and bonds of other companies and its bills and accounts receivable due from other companies. The board's report gave the valuation of the securities on road as \$50,692,419; the Committee makes it \$49,711,067—nearly a million less. The annual report gave the cost of the bonds representing the contingent fund as \$2,000,000; the Committee appraises their value at \$1,000,000. The directors gave the amount of bills and accounts receivable from other com-

panies as \$25,979,067; the Committee makes it \$23,945,107—or more than two millions less. This difference of \$4,000,000 "caused chiefly or wholly by the company's reporting 'cost,' or 'amount,' where the Committee reported 'value,'") is less than 6 per cent. of the face of the stock; and the Committee reports that the total assets of the company show a fair valuation of \$87.28 for each \$50 share—which is not a very bad showing, certainly, for a stock which sells at 54 on the Philadelphia Exchange.

Machine Tools.

With this paper we publish a full page plate showing different kinds of machine tools manufactured by the New York Steam Engine Company. The titles are sufficiently descriptive to indicate the kind of work for which they are intended. Full descriptions and other information can be obtained by addressing the manufacturers at No. 98 Chambers street, New York.

Record of New Railroad Construction.

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

Rochester, Nunda & Pennsylvania.—Extended northward 7 miles to Tuscarora, N. Y. **Cincinnati, Rockport & Southwestern.**—Extended from the south line of Dubois County north by east 15 miles to Jasper, Ind.

This is a total of 22 miles of new railroad, making 1,006 miles completed in the United States in 1874 against 2,455 miles reported for the same period in 1873 and 4,498 in 1872.

THE WISCONSIN SUPREME COURT gave its decision in the injunction cases September 15, and, as was generally expected, it was against the companies. The court holds that the Legislature has, under the provisions of the State constitution, full power to alter or repeal the charters of the companies and that the law of 1874, so far as its provisions were before the court, is a valid amendment of the special charters of the defendants. The question whether it is a valid amendment of the general law of 1872 is not considered. The writs of injunction must be issued as to the lines of the Chicago and Northwestern, and all those of the Milwaukee & St. Paul except the road from Milwaukee to Prairie du Chien, which was built under a territorial charter granted before the adoption of the State constitution, and is therefore exempt from alteration or repeal under the provisions of that instrument. It is ordered, however, that the writs shall not issue until the Attorney General files his official agreement not to prosecute suits for forfeiture of charter until after October 1, that time being given the companies to arrange their tariffs in accordance with the law.

President Keep, of the Chicago & Northwestern, is reported to have said that the company would be obliged to comply with the law, but would also be obliged to economize at every point. Accordingly fewer trains would be run and at slower speed, second-class coaches would be used instead of first-class, all new work stopped, and the force of employees cut down to the lowest possible point.

PULLMAN SLEEPING CARS are coming more into use on the continent of Europe. The last we hear of has gone to Russia, taking a route thither which exhibited it to the admiring eyes of half Europe. The car was built in this country, shipped to London, transferred there to a vessel going to Trieste, at the head of the Adriatic. Here the Austrians so admired it that they ordered two to run between Vienna and Berlin. At Berlin another exhibition was made. This car is said to weigh but sixteen and a half tons, and the ones ordered for Austria are to be but half as large. The charge for a berth from Vienna to Berlin is to be about \$2.70 American currency.

GERMANY during the first half of this year had 411 miles of new railroad opened for traffic within its borders, in nineteen different lines, the longest of which was 64 miles in length. During the same time in Austria and Hungary ten new lines were opened with an aggregate length of 205 miles. During the same period about 640 miles were completed in this country, or more than in both those great countries, so our lack of activity in new construction appears only in comparison with our previous great activity and not in comparison with Europe. There has been an unusual amount of construction in Germany lately, but most of the lines are very short ones.

Magnetic Variations on the Eastern Shore.

SEAFORD, Del., Sept. 1, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I subjoin a list of "Magnetic Variations" furnished by the late Prof. Bache of the Coast Survey, and used in running the boundary line between the eastern shores of Maryland and Virginia, to which region the variations refer. They are fully confirmed by the ancient land-survey records of this part of "the Eastern Shore," and by the observations of the present surveyors, who give the last variation in the list, that for 1874, of 3°30'. It is the fullest and best authenticated record with which I am acquainted bearing on this subject, and I have thought it might possess an interest for some of your readers.

Variation of Magnetic Needle on the Southern Boundary of the Eastern Shore of Maryland.

1668.....	variation = 4°54' West.
1680.....	" " 5°05' "
1690.....	" " 5°08' "
1700.....	" " 4°54' "
1710.....	" " 4°58' "
1720.....	" " 4°56' "
1730.....	" " 3°30' "
1740.....	" " 2°54' "
1750.....	" " 2°18' "
1760.....	" " 1°42' "
1770.....	" " 1°06' "

1750.....	"	0°42'	"
1790.....	"	0°24'	"
1800.....	"	0°18'	"
1810.....	"	0°18'	"
1820.....	"	0°30'	"
1830.....	"	0°48'	"
1840.....	"	1°18'	"
1850.....	"	1°54'	"
1860.....	"	2°30'	"
1870.....	"	3°15'	"
1874.....	"	3°30'	"

Train Accidents in August.

About 3 o'clock on the morning of the 2d, a passenger train on the Washington City, Virginia Midland & Great Southern road ran over a cow near Culpeper, Va., throwing one truck of a sleeping car from the track and damaging it.

On the 2d, at West Aurora, Ill., on the Chicago, Burlington & Quincy Railroad, a fast passenger train was thrown from the track by a splintered rail, the rear trucks being torn from three coaches.

On the evening of the 3d, a passenger train on the New York Central & Hudson River was thrown from the track near Amsterdam, N. Y., by a stone which was wedged in between the rail and a plank on a road-crossing.

On the night of the 3d, a freight train on the Jeffersonville, Madison & Indianapolis road was thrown from the track near Seymour, Ind., by a broken flange, blocking the track some hours.

On the morning of the 4th, a train on the New York & Canada road ran over a cow near Moore's Junction, N. Y., throwing two cars from the track. Both cars went down a bank about 30 feet and upset. A brakeman was badly injured, and four passengers slightly.

On the morning of the 5th, on the Central Pacific road, an engine ran into the rear of an emigrant train which was standing on a side-track at Halleck, Nev., wrecking one car and injuring a passenger.

On the morning of the 6th, a south-bound passenger train on the Connecticut Valley road was thrown from the track near Fort Hill, Conn., by a misplaced switch. The engine, tender and baggage car went into the ditch, and the engineer was badly hurt.

On the 6th, a passenger train on the Wilmington & Reading road ran into the rear of a freight near Springfield, Pa., wrecking the engine and two cars.

Late on the night of the 6th, an excursion train on the Peoria, Pekin & Jacksonville road ran into a freight train which had run upon a siding, leaving one car projecting over on the main track. The engine was wrecked, several cars badly damaged and the engineer much hurt.

Very early on the morning of the 7th, a south-bound passenger train on the Louisville & Nashville road was thrown from the track near Bacon Creek, Ky., at a place where a culvert had been washed out by a freshet. The engine and baggage car passed over, but two passenger cars and the sleeping coach were thrown from the track, the sleeper turning completely over.

On the morning of the 7th, a passenger train on the New York Division of the Pennsylvania Railroad was thrown from the track in Jersey City by a misplaced switch.

On the 7th, a freight train on the Chicago, Burlington & Quincy road, near Monmouth, Ill., ran off the track, blocking the road two hours.

On the afternoon of the 7th, a switching engine on the Burlington & Missouri River road jumped the track on a defective rail in Burlington, Ia.

On the afternoon of the 7th, on the Decatur Branch of the Indianapolis, Bloomington & Western, near Monticello, Ill., a freight car of a mixed train was thrown from the track and wrecked by a broken truck, the baggage car also leaving the track.

On the evening of the 7th, the engine and five cars of a freight train on the Lake Shore & Michigan Southern road were thrown from the track by a misplaced switch at Lenawee Junction, Mich., blocking the road two hours.

On the morning of the 8th, in Atchison, Kan., as a locomotive of the Atchison, Topeka & Santa Fe road was being taken out of the round-house to the tank for water, the man in charge started it in the wrong direction, and it ran off the turn-table and down a bank.

On the 8th, a fast freight train on the Baltimore & Ohio ran into the rear of a local passenger train which was stopping at Hollowfield's, Md., damaging the rear car and the engine of the freight. The passenger was behind time and the freight had the right of way.

On the afternoon of the 8th, the engine of a freight train on the Lake Superior & Mississippi road was thrown from the track by the spreading of the rails and the engineerman badly bruised.

On the night of the 8th, a freight train on the Cleveland, Columbus, Cincinnati & Indianapolis Railway was thrown from the track by a broken wheel near Bellefontaine, O.

On the morning of the 9th, a passenger train on the Western Maryland Railroad was thrown from the track near Owings Mills, Md., by a defective rail.

Very early on the morning of the 10th, a passenger train on the Indianapolis, Bloomington & Western ran into a tree which had fallen across the track near Crawfordsville, Ind., slightly damaging the engine, and throwing the engine truck from the track.

On the 10th, an east-bound freight train on the Central Pacific, drawn by two engines, ran over an ox which was lying on the track in a snow-shed near Emigrant Gap, Cal. The first engine was thrown square across the track, and the second ran off to one side and knocked down 50 feet of the shed.

On the 11th, the tender of an express train on the Central Pacific jumped the track in Sacramento, Cal., delaying the train an hour.

On the night of the 11th, the engine, baggage and express cars of a train on the St. Louis, Kansas City & Northern Railway were thrown from the track by a broken rail. The engineer, fireman and another person were injured.

On the night of the 11th, near Rain Mills, Ind., on the Indianapolis, Bloomington & Western, a west-bound freight was thrown off the track and into the ditch by the spreading of the rails. A fireman fell under a car and was killed.

On the 12th, a freight train on the Indianapolis, Bloomington & Western road was thrown from the track by the breaking down of an overloaded car.

On the evening of the 12th, the Chief Engineer and a number of men who had been working on the Virginia & Truckee road some two and a half miles from Carson, Nev., got upon a flat car and started it down a grade towards that town. The car had attained a high rate of speed when it was found that the brake would not hold and it finally ran into some cars which stood on the track, wrecking two cars and hurting badly Chief Engineer Anderson and three others.

About 6 o'clock on the morning of the 13th an express train on the Southeastern Railway of Canada ran into the north branch of the Mississquoi River near Sutton, Quebec, at a place where a bridge had been carried away during the night by a freshet. The engine, baggage and express cars went into the river and the first two passenger cars telescoped, leaving the two rear cars on the track uninjured. The engineer, fireman, the Assistant Superintendent, who was on board, and two passengers were killed, and 15 persons injured. The train had received no signal or warning of the destruction of the bridge, which was, apparently, not known to any employee.

the road, though farmers along the line are reported to have known it for some time.

On the 13th there was a butting collision between two freight trains on the Philadelphia, Wilmington & Baltimore road, near Perrymanville, Md., by which both engines and several cars were wrecked, and the road blocked several hours.

On the 13th 10 cars of a freight train on the Pennsylvania Railroad were thrown from the track near Christiana, Pa., by a broken wheel. Several of the cars were loaded with oil, which took fire and destroyed them.

On the 13th a west-bound freight train on the Indianapolis, Bloomington & Western road was thrown from the track near Elizabethtown, Ind., by the spreading of the track.

On the 14th a construction train at work on the new line of the Delaware, Lackawanna and Western road west of Bergen Tunnel ran off the trestle at West End, N. J., wrecking several cars, damaging the trestle and injuring a laborer.

On the afternoon of the 14th a train was wrecked on the Indianapolis, Bloomington & Western Railway, within 100 feet of the scene of the accident three days before, caused by a car breaking down.

Very early on the morning of the 15th, during a heavy fog, an express freight on the Toledo, Wabash & Western, which was over an hour behind time, stopped to take water at Sidney, Ill., and immediately afterwards was run into by a following extra. The engine of the extra went through four cars, stopping under the fifth, and was badly damaged; and 11 cars of the extra were ditched. A passenger in the caboose of the first train was killed, and two others hurt.

On the morning of the 15th, a heavily loaded excursion train on the New York Division of the Pennsylvania Railroad ran over a misplaced switch and into the head of a coal train which was standing on a siding at Eddington, Pa. Both engines were damaged and the two first cars of the excursion train telescoped, killing four and wounding 19 persons. The accident is attributed to the carelessness of the switch-tender, who neglected to set the switch right after the coal train had gone on the siding.

On the 15th, a train on the Blue Ridge Railroad ran into a washout near Seneca City, S. C. The engine passed over, but the baggage and second-class car left the track and were wrecked.

On the 15th, a switching engine in the Hoboken yard of the Delaware, Lackawanna & Western Railroad blew out one of the cylinder-heads, fatally injuring a brakeman, who was riding on the front of the engine.

On the evening of the 15th, as an express train on the Northern Railroad of New Hampshire was entering Concord, N. H., the engine was cut loose from the train to make a flying switch into the depot. The switch was not changed quickly enough, however, and the cars followed the engine upon the round-house switch and pushed it across the turn-table, where it upset and was badly damaged.

On the afternoon of the 16th, as an east-bound freight train on the Erie was hauling out of Deposit, N. Y., a coupling broke between two flat cars loaded with long timbers. A timber fell on the track, throwing off a car.

On the morning of the 17th, the engine of a special train on the Flushing, North Side & Central road was thrown from the track by a misplaced switch at Woodside, N. Y., delaying all trains two hours.

On the afternoon of the 17th an empty box car in a train on the Quincy, Alton & St. Louis road caught fire near Keaton's Lake, Ill. The train was stopped and the train men managed to tear the car to pieces so as to save the floor and trucks, which were hauled into Quincy.

On the morning of the 18th a freight train on the Central Pacific road was thrown from the track by a broken rail near Winnemucca, Nev., blocking the track six hours.

On the 18th, as a mail train on the Vermont Central was entering the depot at Windsor, Vt., the baggage car jumped the track at a defective frog and ran into the brick wall of the depot, wrecking itself badly. The following passenger car ran into the baggage and was considerably damaged.

On the morning of the 19th the engine of a gravel train on the Charlotte, Columbia & Augusta road was thrown from the track in Charlotte, N. C., by a misplaced switch, injuring the engineerman and fireman.

About noon on the 19th at Versailles, Ill., on the Toledo, Wabash & Western the flange of a wheel under the tender broke. The engine and tender went off the track and upset, and seven cars were piled up and wrecked. The track was blocked eight hours.

On the 19th as some cars were being switched on the wharf of the Old Colony road at Wood's Hole, Mass., two of them were detached and sent down the wharf at such speed that before they could be stopped they struck an engine and tender which were standing at the end of the siding, waiting shipment for the Martha's Vineyard road, and pushed them both off the wharf into 10 feet of water.

On the 20th, five cars broke loose from a construction train on the trestle work of the Delaware, Lackawanna & Western road at the west end of the New Bergen Tunnel, and running down to the end of the trestle jumped off and were wrecked.

On the afternoon of the 20th, Mississippi Valley & Western train was backed over an open switch and into the ditch at the junction with the Hannibal & St. Joseph at West Quincy, Mo. The road was blocked six hours.

On the evening of the 20th, near Eddyville, Ia., a freight train which was going at high speed ran over a cow, throwing the engine and several cars from the track, the caboose running 40 feet from the track and into a creek. The fireman was killed, the conductor, engineerman and another man injured.

Early on the morning of the 21st, a freight train on the Pittsburgh, Cincinnati & St. Louis was thrown from the track near Steubenville, O., by a broken axle, killing one man who was stealing a ride and wounding another.

On the afternoon of the 21st, a switching engine on the Delaware, Lackawanna & Western road jumped the track on an open switch in Utica, N. Y., and fell 15 feet, landing on its side. The engineerman was badly hurt.

On the 22d, a locomotive on the Central Railroad of New Jersey ran off the turn-table in Elizabeth, N. J., and was badly damaged.

On the afternoon of the 22d, an engine and 28 freight cars went through a trestle work on the St. Louis, Kansas City & Northern near Kansas City, Mo., killing the engineerman.

On the morning of the 24th, the locomotive of a north-bound express train on the New York Division of the Pennsylvania Railroad burst a flue at Rahway, N. J., detaining the train some time.

On the 24th, near Marshall, Tex., on the Texas & Pacific road, there was a butting collision between two trains by which both engines were badly wrecked.

About 3 o'clock on the afternoon of the 24th, as a heavy freight train on the Central Pacific was running up a grade near Blue Canon, Nev., a section broke loose, ran back a short distance and stopped. Shortly after another section broke loose, ran back and into the former section, throwing off several cars and wrecking some of them. Five Chinamen who were in the caboose ran off over a hill and were not afterward seen.

On the night of the 24th, on the Canada Southern road near Cayuga, Ont., there was a butting collision between a passenger and a construction train, by which both engines were badly wrecked.

On the 25th, near Greene, N. Y., on the Utica Division of the Delaware, Lackawanna & Western road a freight train was thrown from the track and the caboose burned.

About 6 o'clock on the morning of the 26th, as the first sec-

tion of a freight train on the Atlantic, Mississippi & Ohio was stopping at Windsor, Va., the second section ran into its rear, wrecking its own engine and the caboose of the first section and killing the fireman. It is said that both engineerman and fireman of the second train were asleep and woke up too late to stop their train.

On the evening of the 26th, the engine of a passenger train on the Canaria Railroad was thrown from the track near Canarsie, N. Y., by a heavy plank laid across the rails. The engine went down a bank and was badly wrecked, injuring the engineerman. A boy, who had placed the plank on the track, was arrested.

On the evening of the 26th there was a butting collision between a freight and an excursion train on the Lake Shore & Michigan Southern road near Toledo, O., by which both engines were wrecked and the track blocked three hours.

On the evening of the 26th a south-bound express on the Grand Rapids & Indiana road ran into two cars which had been left standing on the main track in the yard at Kalamazoo, Mich. The engine and one car were wrecked and a man badly injured.

On the night of the 26th a train on the Kansas City, St. Joseph & Council Bluffs Railroad fell through a bridge at Iatan, Mo., injuring ten persons. The engine passed safely over and remained on the track, but every car left the rails and two went down 25 feet into the creek.

On the 27th as a passenger train on the New London Northern road was near Montville, Conn., the connecting rod broke and one of the loose ends was driven through the boiler into the fire-box. The fire-door being open the steam rushed into the cab, scalding the engineerman badly and the fireman so that he died in a few hours.

On the 27th, the locomotive of a north-bound train on the Delaware Railroad burst a flue near Greenwood, Del., delaying the train some time.

On the 27th, on the Rensselaer & Saratoga road, near Ballston, N. Y., a truck broke under a car of an express train, throwing several cars from the track.

On the morning of the 28th, a car in an east-bound freight train on the New York Central & Hudson River road caught fire when the train was near Crittenton, N. Y., and was entirely destroyed.

On the afternoon of the 28th, an east-bound freight train on the Michigan Central ran over a misplaced switch and into an engine which was standing on the turn-table at Niles, Mich., badly wrecking both engines and the table.

On the morning of the 29th, in St. Paul, Minn., a transfer engine of the St. Paul & Sioux City road ran into a West Wisconsin train, wrecking a box car.

On the morning of the 29th, on the Philadelphia, Wilmington & Baltimore, at Elkton, Md., as some coal cars were being pushed upon a coal trestle siding, the trestle fell, carrying with it the engine and one car.

On the morning of the 31st, at Sugar Grove, Ill., on the Chicago & Iowa Railroad, an engine and three freight cars ran off at a switch whose lock had been broken maliciously.

On the 31st, a passenger train on the St. Paul & Pacific was thrown from the track by a defective rail near Wayzata, Minn., wrecking two cars and injuring three persons.

On the 31st, there was a collision between two coal trains on the Lehigh Valley road near Northampton Furnace, Pa., by which ten cars were wrecked and the track blocked seven hours.

This is a total of 73 accidents, by which 16 persons were killed and 77 injured. Nine accidents caused death, 15 others injury but not death, and 49 accidents, being 67 per cent of the whole number, caused no serious injury to any person.

These accidents may be classified according to their nature and causes as follows:

COLLISIONS.	.....
Rear collisions.....	6
Butting collisions.....	9
Unexplained.....	1
.....	15

DERAILMENTS.	.....
Unexplained.....	6
Misplaced switch.....	7
Cattle on track.....	4
Broken bridge or trestle.....	4
Broken wheel or flange.....	4
Defective rail.....	4
Broken coupling.....	3
Spreading of rails.....	3
Broken rails.....	2
Broken truck.....	2
Malicious obstruction.....	2
Breaking down of overloaded car.....	2
Washout.....	2
Flying switch badly made.....	2
Defective frog.....	1
Broken axle.....	1
Trees on track.....	1
Carelessness in starting.....	1
Car burned while running.....	2
Fuel collapsed.....	2
Cylinder head blown out.....	1
Broken connecting rod.....	1
.....	73

Total
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Of the 16 collisions recorded three were caused by want or neglect of signals, two by misplaced switches, two by carelessness in putting trains on sidings and one by failure of brakes to hold. Of the broken bridges two were trestles, one a wooden bridge; as to the fourth we have no definite information. Thirty-three accidents were caused directly by defects or failures of road or equipment.

The number of accidents for the month is rather below the average and is less than half that recorded in August of last year, when there were 150 accidents, 63 killed and 155 injured. An unusually small proportion of the accidents of last month caused death or injury, although two of them, those at Sutton, P. Q., and at Eddington, Pa., together killed nine, or over half the whole number, and wounded 34, or nearly half of those injured during the month. The number of broken and defective rails and of broken wheels is large enough to be noticeable, and the number of misplaced switches is greater than should be.

For the year ending with August the record is as follows:

No. of accidents.	Killed.	Injured.
September.....	29	75
October.....	11	47
November.....	11	50
December.....	16	43
January.....	18	49
February.....	25	49
March.....	13	12
April.....	3	51
May.....	19	55
June.....	22	104
July.....	20	77
August.....	16	71
Total.....	1,004	205

The average per day for August is 2.35 accidents, 0.62 killed, and 2.48 injured; for the year it is 2.75 accidents, 0.56 killed

and 1.95 injured. The average number of accidents for the month being less, the number injured is greater by about one-quarter than that for the year.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

At the annual meeting of the Indianapolis, Bloomington & Western Railway Company in Urbana, Ill., September 9, the following directors were chosen: D. F. Thompson, Pekin, Ill.; L. J. Bond, Monticello, Ill.; J. C. Short, Danville, Ill.; George Nebeker, Covington, Ind.; F. W. Peck, Chicago, Ill.; Wm. Denison, B. E. Smith, Columbus, O.; C. R. Griggs, Wilmington, Del.; A. Turner, F. Denny, Jr., W. H. Smith, J. B. Thompson, J. R. Blossom, New York. The new directors are Mearns, Peck, Denny, Thompson and Blossom, who replace W. W. Phelps, D. Ricketts, H. Conklin and W. Y. McCord. The board subsequently re-elected the old officers, as follows: B. E. Smith, President; C. R. Griggs, Vice-President; C. W. Smith, General Manager; A. P. Lewis, Secretary and Treasurer.

The new board of directors of the Cincinnati, Rockport & Southwestern Railroad Company met Sept. 7 and elected Wm. Hannaman, of Indianapolis. President in place of S. S. L'Hommedieu, who declined re-election; E. H. Sabine, Vice-President and General Superintendent; Henry G. Hannaman, Secretary and Treasurer; S. S. L'Hommedieu, W. O. Rockwood, Francis Smith, Executive Committee.

Mr. Howard Fry, late Supervisor of Locomotives on the Erie Railway, and formerly on the Grand Trunk, has been appointed Superintendent of Motive Power of the Philadelphia & Erie Railroad in place of Mr. Theodore N. Ely, who was transferred to the Pennsylvania Railroad some time since.

At the annual meeting of the Pullman Palace Car Company in Chicago, September 10, the following directors were chosen: George M. Pullman, C. G. Hammond, John Crerar, Robert Harris, Amos T. Hall, Chicago; Edmund Smith, Philadelphia; J. Pierpont Morgan, New York. Subsequently the board elected officers as follows: George M. Pullman, President and General Manager; C. G. Hammond, Assistant President; Horace Porter, Vice-President; Amos T. Hall, Vice-President pro tem; Charles W. Angell, Secretary.

Mr. Theodore H. Butterfield has been appointed General Ticket Agent of the Utica & Black River Railroad. He has been for several years in the employ of the company.

Mr. H. C. Fiske, of Buffalo, has been appointed General Manager of the Buffalo, New York & Philadelphia Railroad. Mr. Fiske was at one time Superintendent of the Buffalo Division of the Erie.

Mr. James C. Clarke, late General Manager of the Erie Railway, has been appointed General Superintendent of the Toledo, Peoria & Warsaw, in place of Mr. W. H. Cruger, who has resigned.

Mr. John S. Schultz has been chosen President of the New York, Boston & Montreal Railroad Company in place of George H. Brown, resigned.

The old officers of the Connecticut & Passaic Rivers Railroad Company have been re-elected for the ensuing year, as follows: President, Emmons Raymond, Boston; Vice-President, B. P. Cheney, Boston; Secretary, Elijah Cleveland, Coventry, Vt.; Treasurer, N. P. Lovering, Boston.

Mr. Edmund S. Bowen, late General Superintendent of the Kansas Pacific, and formerly on the Northern Central, succeeds Mr. James C. Clarke as chief executive officer of the Erie Railway, but with the title of General Superintendent, the office of General Manager having been abolished.

At the annual meeting of the Cincinnati & Great Northern Railway Company in Van Wert, O., August 29, the following directors were elected: J. R. Carson, New York; R. C. Muller, T. P. Roberts, Pittsburgh; Judge Latimer, Defiance, O.; T. P. Turpen, W. A. Weston, Greenville, O.; Davis Johnson, Van Wert, O.; John A. Hubbard, Wheeling, W. Va. John A. Hubbard was chosen President.

At the annual meeting of the East Tennessee, Virginia & Georgia Railroad Company in Knoxville, Tenn., September 2, the following directors were chosen: R. T. Wilson, Joseph Jaques, C. M. McTigue, S. D. Reynolds, Joseph H. Ernest, E. H. Richards, S. B. Boyd, Dr. W. R. Sevier, Thomas G. Barrett, Wm. C. Kyle, R. C. Jackson, Joseph R. Anderson, John Talbot, M. K. Jesup and Adrien Iselin. The only change is the election of Mr. Iselin in place of Rev. Robert Iselin, who declined to serve longer. The board subsequently re-elected the old officers, as follows: R. T. Wilson, President; Joseph Jaques, Vice-President and Superintendent; C. M. McTigue, Assistant Vice-President; Jas. G. Mitchell, Secretary and Treasurer.

Mr. W. B. Strong, formerly Superintendent of the Burlington & Missouri River Railroad, and since the consolidation Assistant General Superintendent of the Chicago, Burlington & Quincy, has been appointed Assistant General Superintendent of the Michigan Central Railroad, in place of C. H. Hurd, resigned. Mr. Strong has been greatly valued by the company he has served as a man of remarkable ability.

PERSONAL.

Mr. L. M. Hubby, who was appointed Railroad Commissioner for the Cleveland District under the arrangements made at the Cleveland meeting, has declined on account of ill health.

Mr. Howard Fry, who was recently appointed Superintendent of Motive Power on the Philadelphia & Erie, sailed for Europe on a short visit, September 12.

Mr. W. H. Cruger has resigned his position as General Superintendent of the Toledo, Peoria & Warsaw road, and will shortly go to Europe on a visit.

It is stated that Mr. W. B. Strong has resigned his position as Assistant General Superintendent of the Chicago, Burlington & Quincy, and that he will accept a position on the Michigan Central.

Mr. C. H. Hurd has resigned his position as Assistant General Superintendent of the Michigan Central Railroad and will retire to a farm which he owns in Concord, Mass. Mr. Hurd has been connected with the Michigan Central for 25 years past.

Mr. M. L. Sergeant has been appointed General Ticket Agent of the Atchison, Topeka & Santa Fe Railroad, with offices at Topeka, Kan.

Hon. Alexander Mitchell, President of the Chicago, Milwaukee & St. Paul Railway Company, refused to be a candidate for re-election to Congress from the Milwaukee district.

TRAFFIC AND EARNINGS.

The earnings of the Great Western Railway of Canada for the week ending August 21 were: 1874, £19,218; 1873, £19,877; decrease, £659, or 3% per cent.

The earnings of the Grand Trunk Railway for the week ending August 22 were: 1874, £29,600; 1873, £29,200; increase, £400, or 1 per cent.

The earnings of the Northern Railway of Canada for the half year ending June 30 were: 1874, £20,904; 1873, £25,666; decrease, £4,762, or 5% per cent.

The earnings of the Toronto, Grey & Bruce Railway for July were: 1874, £31,336; 1873, £14,713; increase, £16,623, or 113 per cent.

San Francisco wheat shipments during August were 23 cargoes, amounting to 30,318 tons, a decrease of 5% per cent. from 1873. One shipment of 150 tons went by steamer to Panama and thence to Liverpool. The flour shipments were 26,122 barrels, being an increase of 51 per cent. over 1873. The total shipments, reducing flour to wheat, were: 1873, 34,235 tons; 1873, 34,810 tons; decrease, 575 tons, or 1% per cent.

The earnings of the Cleveland, Columbus, Cincinnati & Indianapolis Railway for the six months ending June 30 were as follows:

Earnings (\$4.327 per mile)	\$2,033,600 65
Expenses (52.91 per cent.)	1,686,099 75

Net earnings (\$739 per mile)

.....	3347,500 91
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As compared with the same period last year, there is a decrease of £453,449.61, or 18% per cent. in gross earnings; a decrease of £97,544.78, or 5% per cent. in expenses; and a decrease of £355,904.83, or 15% per cent. in net earnings.

The following is a statement of the earnings and expenses of the Chesapeake & Ohio Railroad for the six months ending June 30:

1874.	1873.	Increase.	Decrease.	P. C.
Earnings.... \$661,301 28	\$537,042 80	\$124,268 78	.....	23%
Expenses.... 575,021 40	427,827 55	148,193 85	.....	34%

Net earnings. \$85,279 88 \$109,214 95 \$23,935 07 21%

The expenses were 10 per cent. of earnings in 1874 and 79.66 per cent. in 1873. The gross earnings for July and August were: 1874, 337,277.61; 1873, £275,423.14; increase, £61,864.47, or 22% per cent.

The earnings of the New Jersey and New York (Hackensack) Railroad for the year ending April 30, 1874, were:

Earnings (\$7.273 per mile)	\$152,736 89
Expenses (65.12 per cent.)	99,465 08

Net earnings (\$2,537 per mile)

.....	55,271 86
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The coal tonnage of the Chesapeake & Ohio Railroad for the eight months ending August 29 was 97,325 tons, or 9,733 car-loads.

The net earnings of the Southwestern Pennsylvania Railroad for the six months ending June 30, 1874, were £51,188.51, or £2,133 per mile.

The earnings of the Midland Railway of Canada for the eight months ending August 31 were: 1874, £305,206; 1873, £220,981; decrease, £15,775, or 7% per cent.

The earnings of the Chesapeake & Ohio Canal for August were: 1874, £63,929.85; 1873, £28,178.81; increase, £35,751.04, or 126% per cent. The coal tonnage for the month was: 1874, 106,874 tons; 1873, 48,305 tons; increase, 58,569 tons, or 121% per cent.

The coal tonnage of the New Jersey lines operated by the Pennsylvania Railroad Company for the eight months ending August 29 was 901,962 tons. Of this 182,194 tons went to Coal Port and 430,489 tons to South Amboy for shipment, and 189,339 tons to way points.

The following is the official statement of the net earnings of the Pennsylvania Railroad for the six months ending June 30:

1874.	1873.	Increase.	Decrease.	P. C.
Main line.... \$4,329,577 54	\$3,895,204 88	\$434,282 66	.....	11%
New Jersey lines. 1,147,057 74	516,666 39	630,391 35	.....	122

Total.... \$5,476,635 28 \$4,411,961 27 \$1,064,674 01 24%

The earnings and expenses of the Denver & Rio Grande Railway (main line) for July were:

1874.	1873.	Increase.	Decrease.	P. C.
Earnings.... \$40,782 20	\$39,300 63	\$1,481 67	.....	20
Expenses.... 15,501 92	19,364 15	.....	\$3,861 23	3%

Net earnings. \$25,280 28 \$19,936 98 \$5,343 90 26%

The earnings were \$346 per mile in 1874 and \$333 in 1873. The expenses were 38.01 per cent. of earnings in 1874 and 49.27 per cent. in 1873.

The following companies have thus far reported earnings for August:

1874.	1873.	Inc.	Dec.	P. C.
Atlantic & Pacific.... \$459,779	\$438,168	\$21,611	.....	4%
Burlington, C. R. & Minn.... 114,316	108,100	6,216	.....	5%
Central Pacific.... 1,301,000	1,251,622	49,378	.....	4
Chic., Milwaukee & St. Paul.... 704,300	767,871	.....	\$63,571 84	8%
Cleve., Col. Ind. & N. E.... 403,175	457,964	.....	54,789 12	12
Cin., Lafayette & Chicago.... 38,155	.....	.....	.....	.....
Chesapeake & Ohio.... 183,010	152,048	30,962	.....	20%
Denver & Rio Grande.... 35,285	36,597	.....	1,311 35	3%
Illinois Central.... 708,908	769,748	.....	60,940 7%	8
Missouri, Kansas & Texas.... 269,000	336,923	.....	47,928 14%	14
Ohio & Mississippi.... 324,360	306,561	17,799	.....	5%
St. Louis, Alton & T. H., main line.... 113,448	127,777	.....	14,329 11%	11
St. Louis, Alton & T. H., branches.... 49,998	54,048	.....	4,048 7%	14
St. Louis, Iron Mt. & Son.... 254,230	222,753	31,477	.....	14%
Toledo, Peoria & Warsaw.... 67,139	98,163	.....	31,030 81%	81
Toledo, Wabash & Western.... 478,475	647,080	.....	168,605 26	26
West Wisconsin.... 66,791	66,092	699	.....	1

The earnings of the Indianapolis, Cincinnati & Lafayette Railroad for July were:

1874.	1873.	Increase.	Decrease.	P. C.
Earnings.... \$141,530	\$159,174	.....	\$17,635 26	11%
Expenses.... 116,174	109,148	.....	20,974 19	19

Net earnings.... \$33,365 \$50,026 \$3,339 6%

The expenses were 62.30 per cent. of earnings in 1874 and 68.57 per cent. in 1873.

THE SCRAP HEAP.

Railroad Manufactures.

The Ohio Falls Car Works, at Jeffersonville, Ind., have been building a number of freight cars for the Des Moines & Minnesota Railroad.

The Southwestern Car Works at Jeffersonville have been working on repairs for the Indianapolis, Bloomington & Western road.

The works of the Girard Rolling Mill Company, at Youngstown, O., are being much increased. Their new addition is now finished, and is 130x46 feet, and will contain the necessary machinery for making nuts, bolts, washers, ear-links and pins, &c. The wing of this addition is 80x50 feet, and is used as a machine shop for repairing. Still another addition has been commenced, 40x80 feet, to contain 6 puddling furnaces, which will make 16 in all. There are already in use three trains of rolls.

It is said that the Columbus Rolling Mill Company has contracted to furnish rails to a railroad company for £52 per ton.

The creditors of Messrs. James I. Bennett and John Moorhead for assignees. It is believed that if the assets of the firm are handled well a large balance will be left after paying off the indebtedness.

The National Locomotive Works of Dawson & Baily at Con-

nellsburg, Pa., have an unusually large force employed and are filling orders for various roads, including the Denver, South Park & Pacific, Galena & Southern Wisconsin, Toledo & Ohio and others.

The Pittsburgh and McKeesport Company, which recently commenced building locomotives, has been running steadily and has still orders on hand. Some light engines for a Florida road were recently turned out.

The Covington (Ky.) rail mill of James S. Kyle & Co. is running double time, with a fair prospect of full work during the balance of the year.

The Manchester (N. H.) Locomotive Works have been building some engines for the Galveston, Harrisburg & San Antonio Railroad.

New Train Signal.

Mr. J. C. McMullin, General Superintendent of the Chicago & Alton Railroad, has invented a new signal lamp for the tail of trains, which is intended to indicate approximately to the following train the distance between them. The Chicago Tribune describes it as follows:

"The new signal is composed of two lamps, connected by a galvanized iron tube about three feet long and three inches in diameter. One of the lamps has a red bull's-eye lens, and the other a white one. The light is placed in one of the lamps only, and is conveyed from the burner through a tube upon a reflector on the other lamp, where it is deflected and made to show out through the lens the same as though the burner were directly behind the lens, thereby producing, burning one burner, two lights with uniform brilliancy, that will blend regularly together whether burning high or low. The lamp is placed upon the top of the caboose on a raised platform that is made to revolve so as to show a light in either direction."

"At a distance of one inch and upwards the white and red lights blend together and show but one strong red light, which in a clear atmosphere can be seen from four to six miles. If within seven-eighths of a mile of the train, the red and white lights are partly blended together. If within three-fourths of a mile, the red and white light are three inches apart; at one-half mile, 12 inches; at one quarter mile 20 inches, and at a distance of 100 feet the lights are 40 inches apart. The different conditions of the atmosphere do not interfere with the relative spaces between the two lights. If, for example, it is so foggy that the lights cannot be seen more than one quarter of a mile, the moment they are seen they will appear 20 inches apart, at once warning the engineer that he is within a quarter of a mile of the preceding train, and he must use every means possible to stop his train and prevent a collision."

OLD AND NEW ROADS.

Columbus, Chicago & Indiana Central.

Mr. C. W. Haseler, in his *Financial Report*, makes the statement that the endorsement referred to in the Pennsylvania Railroad Company's advertisement was printed on the bonds by authority of the Columbus, Chicago & Indiana Central Company. Mr. Haseler states that the original lease of the road to the Pittsburgh, Cincinnati & St. Louis was executed January 22, 1869, and included a guarantee of the \$5,000,000 of second, as well as of the \$15,921,000 first-mortgage bonds. An amended lease was executed February 1, 1870, under which no guarantee of the second-mortgage bonds was given. It is now alleged that the first lease was the one ratified by the stockholders, and that the amended lease was never so ratified; but the railroad companies have the records and must know what they are about when they make such a statement, which would be no them possible good if it was not true.

Hempstead & New York.

There is a report that the Delaware & Lackawanna Coal Company is negotiating for the purchase of this road, and, if bought, will complete it at once to Bay Ridge and build suitable docks there. Coal cars can then be ferried on barges across the bay, landed at Bay Ridge, and go from there to any point on Long Island which is reached by railroad.

The completed portion of the road, from Valley Stream on the South Side road to Hempstead 15½ miles, is to be sold under foreclosure of mortgage in Hempstead, N. Y., October 28. The sale includes the franchises and charter of the company.

Chesapeake & Ohio.

Messrs. Fisk & Hatch have issued a circular supplementary to that of last month in which they state that the holders of about \$10,000,000 of the first-mortgage bonds have already funded, or agreed to fund, their coupons; nearly all of the second-mortgage have accepted the proposition, and over three-quarters in amount of the creditors.

The circular gives, besides a statement of the earnings of the road, the following summary of the condition of the company at the date of the last annual report, October 1, 1873:

Capital stock authorized by charter..... \$30,000,000 00

Capital stock outstanding..... 15,866,401 96

Number of stockholders..... 985

First-mortgage 6 per cent. bonds..... \$15,000,000

from the Court the Receiver has applied the net earnings to payment of these claims and has paid off about \$25,000. The holders of the rest made application September 13 for a modification of the order of foreclosure and sale which will allow them to come in with the bondholders for a share of the proceeds of the sale, or, failing that, for a continuance of the receivership until the claims are paid out of net earnings. The Court ordered testimony to be taken. The foreclosure sale was to have taken place September 15.

Montclair.

It is stated that the second-mortgage bondholders have submitted a proposition to the first-mortgage bondholders, offering to advance the money needed to put the road in order, complete and equip it, provided the sum so advanced is made a first lien on the road. The amount named to be advanced is \$600,000.

Houston & Texas Central.

Arrangements are being made to change the gauge of 91 miles of the main line, from Corsicana, Tex., south to Hearne, the crossing of the International. The break from 5 feet 6 inches to 4 feet 8½ inches gauge will then be made at Hearne instead of Corsicana. The machinery for changing car trucks is being put up at Hearne. The company will then have 221 miles (Denison to Hearne) of standard gauge. This will probably also involve the change of the 45 miles of the Waco Branch.

Southern Maryland.

A meeting of creditors was held recently in Washington to ascertain the condition of the company and see what arrangements could be made to secure creditors' claims. It was stated that of the 60 miles from Brandywine to Point Lookout, 46 have been graded, with bridges and culverts in; 60,000 ties are now being delivered along the lines; the rights of way have been secured, as also lands for depot purposes, coal wharves, &c. Under authority of the Legislature of Maryland the question of the city of Baltimore subscribing \$250,000 for the completion of the road will be submitted to the voters of that city at the November election.

Delaware.

Arrangements are being made to put on again the fast freight line from Crisfield, Md., to Philadelphia and New York, which was run for some time a few years ago. The steamboat line from Crisfield to Norfolk will also probably be put on again.

Pennsylvania & Sodus Bay.

An effort is being made to bend the town of Seneca Falls, N.Y., for \$80,000 to secure the completion of this road.

West Pennsylvania.

A suit is now pending between this company and the Columbia Conduit Company as to the right of the latter to lay its pipe under the track of the railroad. The Conduit Company is building an oil pipe line which is to run from the Butler Oil District to Allegheny City, which, if completed, will be a competitor for much of the oil business now carried by the road. The railroad company claims that the other party is not a corporation which has a right to the use of any portion of its property under the Pennsylvania general law, and refuses to sell the right to lay the pipes under its road-bed.

Pacific Mail.

There are reports that a new steamship line from San Francisco to China and Japan is to be started and backed by a combination composed of the Union and Central Pacific companies and some of the trunk lines from New York and Baltimore to Chicago. These reports have arisen from the quarrel between the Pacific Mail Company and the Pacific railroad companies, and it is impossible to say how much, if any, truth is in them.

St. Louis Union Stock Yards.

The new yards of this company were formally opened for business September 10. They cover 23½ acres and have all the necessary buildings, and have direct connection with all the roads entering St. Louis from the west except the St. Louis, Iron Mountain & Southern, and a connection with that road will shortly be made.

Rochester & State Line.

The road from Rochester, N.Y., to Le Roy, 25 miles, has been opened for business. Regular trains began to run September 15.

Rochester, Nunda & Pennsylvania.

The track is laid to Tuscarora, N.Y., 17 miles north of the southern terminus and about three miles from Mount Morris. An engine and number of cars are on the road.

Western Texas Narrow Gauge.

The city of Houston, Tex., has voted to take \$100,000 stock in this company, and work is to be begun at once. The road is to be of 3-foot gauge and to extend from Houston, Tex., west about 200 miles to San Antonio.

Goldsboro & Clinton.

It is proposed to build a railroad from Goldsboro, N.C., southwest about 30 miles to Clinton, in Sampson County.

Cape Breton.

Nearly 10 miles of the road back from Louisburg, Cape Breton, are finished, and the iron bridge over the Mire River is well advanced. The road is being ballasted, and it is believed that it will be finished far enough to bring coal to Louisburg wharf before winter.

Yarmouth.

Considerable grading is done and tracklaying has been commenced on this road, which is an extension of the Windsor & Annapolis from Annapolis to Yarmouth, at the extreme southwestern point of Nova Scotia.

Syracuse, Phoenix & Oswego.

The original intention of this company was to use the Syracuse Northern road from Woodward's to Syracuse, but since the latter road passed under the control of its present owners that cannot be done. It has been decided to form a new company to build 7½ miles of road, from Woodward's to Syracuse.

St. Louis, Keosauqua & St. Paul.

All work has been stopped and several law suits have been commenced to decide the ownership of the road-bed, so far as done, and other property.

Nevada County.

The directors have determined finally to go on with the work and build the road from Nevada City, Cal., to the Central Pacific at Colfax. Proposals have been advertised for and 10 per cent. of all subscriptions called in.

Worcester County Central.

The surveys of the line from Worcester, Mass., west by north to Hardwick are nearly completed.

Lowell & Andover.

Tracklaying has been commenced and a locomotive and construction train has been put on the road.

Texas & Pacific.

The contractors west of Dallas have asked the people of Fort Worth to subscribe for \$60,000 county bonds at 50 cents on the

dollar, in order to enable them to complete the road to Fort Worth.

The Paris (Tex.) Press says that the contractors are tearing up the bridges along the line of the Transcontinental Division, between that city and Brookston, and shipping the timber beyond Dallas, where work in the direction of Fort Worth is progressing.

A meeting of the directors was to be held in Philadelphia this week for the purpose, it is stated, of considering the question of an application to Congress for a subsidy.

Buffalo Coal Company.

A company by this name has been formed in Buffalo, N.Y., and has secured control of a large tract of coal land in McLean County, Pa., which it proposes to work actively. In order to reach the property the company is making arrangements to build a railroad 25 miles long, from Larabee's, on the Buffalo, New York & Philadelphia, southwest to Bishop's Summit.

Buffalo & Jamestown.

The grading from Gowanda, N.Y., to Dayton is well advanced and work has been begun between Dayton and Cherry Hill. Beyond Dayton in the Cennewango Valley the work is comparatively light.

Dividends.

Dividends have been declared by the following companies: New York Central & Hudson River, 4 per cent., semi-annual, payable October 15. Transfer books will be closed from September 17 to October 20.

Dubuque & Sioux City.

2 per cent., payable October 15. East Tennessee, Virginia & Georgia, 3 per cent., semi-annual, payable October 1.

Meetings.

The companies named will hold their annual meetings at the times and places given:

Ohio & Mississippi, at the company's office in Cincinnati, O., October 8, at 16 a.m.

New York, Providence & Boston, at the company's office in Providence, R.I., September 29, at 10 a.m.

New Jersey Southern, at Long Branch, N.J., October 14, at 12 noon.

Rockford, Rock Island & St. Louis, at Rock Island, Ill., October 14.

Syracuse Northern.

The arguments in the foreclosure suit brought by the second-mortgage bondholders is to be heard at a special term of the Supreme Court this month.

Utah Western.

The grade from Salt Lake City to Lake Point is being finished up. The principal bridges are completed and the rest of the bridging is being made ready.

Lake Shore & Michigan Southern.

Trains on this road now run to the new transfer depot in William street, Buffalo, instead of the old depot in that city.

Junction & Breakwater.

A steamer line from New York to Lewes, Del., the bay terminus of this road, has been established by the Old Dominion Steamship Company, which now owns a controlling interest in the road.

Montclair.

The committee of bondholders requests all holders of first-mortgage bonds to communicate the amount and number of their bonds to Wm. O. McDowell, No. 25 Nassau street, New York.

East Tennessee, Virginia & Georgia.

At the annual meeting in Knoxville, Tenn., September 2, the stockholders voted to ratify the contract made with the North Carolina Railroad Company, by which that company agreed to repay all money spent by the East Tennessee Company on account of the Western North Carolina Railroad, and also to complete the road to the State line at Paint Rock, the Tennessee Company agreeing, on its part, to extend the Cincinnati, Cumberland Gap & Charleston road from its present terminus, at Wolf Creek, to Paint Rock.

There was also some discussion as to local freight rates, and as to passing stockholders to the annual meetings.

Railroads in Mexico.

The Government of Jalisco has approved the statutes of the Guadalajara & San Pedro Railroad Company, the provisional Board of Directors having been organized as follows: President, Sr. D. Antonio Alvarez del Castillo; Vice-President, Sr. D. Teodoro Kunhardt; Secretary, Sr. D. Antonio Mijares; Sub-Secretary, Sr. D. Jesus Camarena; Treasurer, Sr. D. Agustín L. Gomez. It has been reported in Mexico that a company has been organized in London to construct a railroad from the Gulf of California at Guaymas, in the State of Sonora, due north 300 miles to Tucson, Arizona, about 35 miles being in the United States. The report is that there are to be 50,000 shares of \$20 each. The State of Sonora favors the project, but the Government of Mexico has given no charter for such a line. The country on the line is very thinly peopled and desolate.

New York Central & Hudson River.

The board of directors at the last meeting, after declaring the usual 4 per cent. semi-annual dividend, resolved that hereafter dividends should be made quarterly—in January, April, July and October—instead of half-yearly.

It is stated that the company has negotiated \$8,000,000 more of its bonds in London, at a price equivalent to 105 in currency. The money thus provided will be sufficient for the completion of the third and fourth tracks to Buffalo.

United States Contracts.

Col. S. T. Abert will receive at his office, No. 812 Seventeenth street, Washington, D.C., until September 22, proposals for the following works:

Dredging and construction of dyke, Rappahannock River.

Dredging mouth of Occoquan River.

Dredging Nomini Creek.

Dredging Aquia Creek.

Erie.

Some time since the authorities of Lackawaxen township in Pike County, Pa., assessed taxes on the property of the company in that town and subsequently, payment being refused, levied on the property. The company has never paid local taxes in Pennsylvania, as it has always been held that the annual payment of \$10,000 to the State was in lieu of all other taxes. Recently the District Court granted a temporary injunction prohibiting the sale of the property levied on until the case can be tried at the regular term of the court, which meets at Milford, Pa., September 22.

The engine house at Otisville, N.Y., on the Eastern Division, was burned on the night of September 10, with the engine of a construction train which was in it at the time. The loss is said to be \$30,000.

It is stated that among the results of the recent business

tour of the leading officers over the line will be an increase in the privileges of ticket holders as to stopping over on the road and the time for which tickets are good, and an increase in local accommodations on certain parts of the line.

The old Erie building at Duane and West streets, New York, is being prepared for the removal thither of the general offices.

As an additional check upon conductors the tickets on through trains will hereafter be taken up by collectors, who will come on the train near the end of the route, the conductor only canceling the ticket and leaving it with the passenger.

Pennsylvania.

It is stated that the report of the Investigating Committee, which will make a volume of nearly 300 pages, will, without seriously censuring the past management, recommend a more conservative policy in future. The management, however, is blamed for the anomalous position held towards the Philadelphia & Erie road, and for the heavy losses incurred in consequence of the investments south of Baltimore. The value of the Western connections is thoroughly discussed and the conclusion reached that farm products will not at present prices bear transportation and yield a fair profit, that the tendency of prices is downwards, and that no further reduction of rates can be afforded.

In going through the assets a heavy reduction has been made in many cases from the values given in the last report. This is notably the case with the interest in Allegheny Valley, Pittsburgh, Cincinnati & St. Louis, Philadelphia & Erie, and Baltimore & Potomac securities.

Cincinnati, Rockport & Southwestern.

Track is laid from Rockport, Ind., a little east of north to Jasper, a distance of about 40 miles. The road has thus far been built entirely with money furnished by the stockholders, and there is no floating debt. A mortgage for \$6,000 per mile was executed, but the bonds were not sold.

Junction City & Fort Kearney.

The Clay Center (Kan.) Dispatch says that work has been resumed on this road and grading is in progress from Clay Center, the present terminus, northwestward up the Republican Valley.

St. Louis & Southeastern.

The Evansville (Ind.) Courier of September 10 says: "A meeting of holders of first-mortgage bonds of the Evansville, Henderson & Nashville Railroad was held a few days ago, at the office of William Alexander Smith & Co., in New York. Measures for holders were taken, but we have not yet learned the result of their deliberations; but from the fact that the holders of \$187,000 worth of the first-mortgage bonds of the Evansville, Henderson & Nashville Company have already applied for the foreclosure of the mortgage and the appointment of a receiver of the effects of the road, it is inferred that the holders of the first-mortgage bonds in New York resolved at this meeting to become parties to the suit. The latter represent the balance of the \$1,000,000 mortgage bonds. There is little doubt that this brings the financial troubles of the Southern Division of the Southeastern road to a crisis."

Southern Pacific, of California.

Recently an application was made to the city of Los Angeles, Cal., for the transfer to this company of the 750 shares held by the city in the Los Angeles & San Pedro Railroad Company, under an agreement made some two years ago. The city authorities have refused to make the transfer on the ground that, while the company has laid the amount of track required, it has not yet built a depot and shops in the city, which was also required in the agreement.

Surveys are being made for the line from Los Angeles to the Tehachepa Pass.

It is stated that a new line is to be built from San Francisco to the Seventeen-mile House, on the route by South Beach and Potrero. Arrangements are being made for the right of way. It is intended to put on more trains between San Francisco and San Jose and do as much as possible to develop the suburban traffic.

New Jersey Midland.

The earnings of this road for August are reported, in round figures, at \$85,000 (\$625 per mile) and the current expenses at \$31,000. Interest on the funded coupons has been promptly paid, as have been generally the wages of employees. The freight business shows a steady increase, especially in the milk business, and also in butter and cheese freights. During the present year 600 tons of rails have been used for repairs, which appears to be a very large amount for so new a road. Several locomotives and a number of cars have been added to the equipment.

Des Moines Southern.

It is stated that arrangements are being made to organize a company by this name to build a railroad from Des Moines, Ia., southward to a connection with some line leading to St. Louis.

Marietta & Cincinnati.

The car-repair shops at Zaleski, O., caught fire on the morning of September 9 and were entirely destroyed, with about 25 freight cars, most of which were old and in a more or less damaged condition. The loss is estimated at \$75,000.

Dakota Southern.

Surveys have been begun for an extension from Yankton, Dak., northwest to Brule City, a distance of about 100 miles, in the direction of the Black Hills.

Atlantic & Lake Erie.

Work on the section from New Lexington, O., to Moxahala is progressing rapidly. The iron has commenced to arrive and is being laid as fast as possible.

Osage Valley & Southern Kansas.

This road is advertised to be sold under foreclosure of mortgages in St. Louis, December 10. The road is 25 miles long, from Tipton, Mo., north to Boonville, and is operated by the Atlantic & Pacific Company.

South Side of Long Island.

The foreclosure sale has been again postponed, from September 9 to September 16.

New Mail Routes.

Extensions of mail service have been ordered over the following new lines:

- Valley Railroad, of Virginia, from Harrisonburg, Va., to Staunton, 26 miles.
- Galveston, Harrisburg & San Antonio, from Flatonia, Tex., to Luling, 35 miles.

Chicago, Pekin & Southwestern.

Surveys have been begun for the extension from Streator, Ill., northeast to Joliet, and it is said that the means are provided for building this section of road at once.

Illinois Central.

The Dunleith & Dubuque bridge is undergoing repairs and will probably be closed for two weeks. Meantime the Illinois Central trains cross the Mississippi on the Chicago & Northwestern bridge at Clinton.

Columbus, Chicago & Indiana Central.

Notice is given by the President of the Pennsylvania Railroad Company that he has been advised by correspondents that the following statement has been placed upon certain bonds of

this company secured by second mortgage of the property: "The within bond is additionally secured by a lease of the road to the Pittsburgh, Cincinnati & St. Louis Railway Company, and the payment of interest and principal of the entire series of bonds mentioned herein is guaranteed by the Pittsburgh, Cincinnati & St. Louis Railway Company and the Pennsylvania Railroad Company."

Both these companies therefore desire to state that they never authorized this or any other statement to be placed on these bonds, and that they did not know of its existence until the failure of the Columbus, Chicago & Indiana Central to pay interest on these second-mortgage bonds August 1, 1874. These bonds are not included in the terms of the existing lease, and neither the Pittsburgh, Cincinnati & St. Louis, as lessee, nor the Pennsylvania, as guarantor, is responsible in any way for these bonds or the interest thereon, unless there should be a surplus of net earnings or rental applicable thereto under the terms of the lease.

Valley of Virginia.

The board has resolved to continue work at the present rate until December, when there will be some reduction in the estimated allowed contractors monthly.

The convention to advocate the extension from Salem to the Tennessee line met in Staunton, Va., September 9, with a large attendance and passed resolutions in favor of the extension, and requesting the Legislature to grant the necessary charter.

Painesville & Youngstown.

Work is progressing on the unfinished section between Niles, O., and Youngstown, which, it is expected, will be completed in October.

Smyrna & Delaware Bay.

This road was to be sold at sheriff's sale in Smyrna, Del., September 17, to satisfy a number of judgments. The road is 16 miles long, from Bombay Hook, Del., west to Massey's, the junction of the Kent County and Queen Anne's & Kent roads. The rails were laid last year, but it is not ballasted and has never been operated. It was intended to be part of the New Jersey Southern's line to Baltimore, but work was stopped when that company failed.

Santa Barbara & Tulare Valley.

A project is on foot for a narrow-gauge road from Santa Barbara, Cal., northwest to Bakersfield in the Tulare Valley.

Lancaster Air Line.

It is now proposed to build from Lancaster, Pa., nearly due east, striking the Stony Creek road near Norristown and connecting through that road with the North Pennsylvania and its new line to New York.

Stockton & Ione.

H. B. Platt, contractor for the construction of this road, has concluded a contract with the Arroyo Seco Grant Company, whereby the latter agree to donate to the railroad the right of way through their possessions and twenty-five acres of land near Ione City, Cal., for depot purposes, together with the privilege of mining and hauling coal from the coal beds on the grant for a number of years. On the other hand, Mr. Platt agrees to pay the Grant Company 50 cents per ton for a specified amount of coal so taken out each year, and to finish the road to Ione within two years from the time work is commenced on the same.

The Hudson River.

During the past year surveys have been made under the direction of the New York Canal Commissioners to ascertain the possibility of providing an additional supply of water for the Hudson River. It is now proposed to regulate the present supply by erecting dams on the upper tributaries to hold back the water which comes down in the spring freshets. It is also proposed to bring a very large additional supply from Rackett, Forked and Long Lakes, in the Adirondack region, which now have their outlet in Cold River, a tributary of the St. Lawrence, by damming Cold River just below the outlet of Long Lake. The water from these lakes can then be turned into a tributary of the Hudson by building a canal a mile and a quarter long and 11 feet deep. The scarcity of water at Troy and even below Albany has been a source of trouble for some years past.

Low Freights.

The Buffalo Commercial Advertiser of September 3 says: "There have been periods in which freight rates have ruled very low in consequence of short crops or commercial panics, but never before in the history of our lake marine have freights by water averaged so low as they have the present season. From the opening of navigation to this time hardly one profitable charter has been secured. Rather than continue the ruinous competition nearly as many vessels of all descriptions have recently laid up as remain in commission. This great reduction of the available tonnage has helped the matter a little, so that the large and more economical vessels are now paying expenses—but that is about all."

"The demoralized condition of the carrying trade may be judged from the following statement of the average freights on wheat and corn from Chicago to Buffalo, and the average rate on the same cereals by canal from Buffalo to New York, for the month of August in the ten years named:

Year.	LAKE.		CANAL.	
	Wheat. Cents.	Corn. Cents.	Wheat. Cents.	Corn. Cents.
1865	7.1	6.6	14.5	12.5
1866	10.3	8.4	15.7	13.3
1867	5.6	4.1	18.7	11.7
1868	7.8	6.6	14.1	11.6
1869	5.0	4.8	14.0	12.0
1870	5.0	4.7	9.4	9.2
1871	6.2	5.7	11.8	10.8
1872	9.6	8.8	12.0	11.0
1873	6.5	5.6	10.6	9.6
1874	3.1	2.1	9.0	8.0

"From this exhibit it will be seen that the average rate last month was lower by both lake and canal than the average of either of the nine preceding years. By lake the average freight for August, 1874, was not half as much as that for August, 1873, and it was less than a third of the rate for the preceding August.

"The low freights this season are principally due to the general depression in all departments of trade. At the opening of navigation vast quantities of grain were awaiting shipment at the West, and a large amount has come from the interior since; but, there being scarcely any other property to carry, every sort of craft went for grain freights, and the supply of tonnage was largely in excess of the demand. Thus the rates went down to the bottom figure. It would not have remained there long, however, had it not been for the existence of so many mammoth carriers. These vessels can do business profitably at lower figures than their less capacious rivals, and they continued at work for rates which, four or five years ago, would have forced the entire lake fleet to tie-up.

"It is evident from this fact that freights would not have averaged as high this season as formerly, even if business had been in its normal condition. How rapidly the large-class vessels are increasing is shown by the capacity of the fleet that has passed Detroit this week. The fleet numbered eighty-eight vessels, having cargoes aggregating 1,414,000 bushels of wheat, 862,000 bushels of corn, 21,000 bushels of oats and 12,000 barrels of flour. Thirteen of the vessels carried upward of 50,000 each; ten carried 40,000 bushels each and upward; five carried 50,000 or more each, and one carried 68,000 bushels.

The proportion of monster vessels in this fleet was not unusual. The same average would doubtless be found in any fleet containing the same number of vessels.

"The advent of these large vessels is a long step in the direction of cheap transportation; but they make rather hard lines for the owners of small craft, which are driven out of the business."

Action of the British Railway Commission.

We have heretofore called attention to the work of this commission, and publish the following as an example of the class of cases which comes before it, and of its method of treating them:

The case of the Carmarthen & Cardigan Railway Company v. the Central Wales & Carmarthen Junction Company came before the court Monday, August 24, when the Chief Commissioner (Sir Frederick Peel) delivered the following judgment. The case was concluded on the 6th of September, on the seventh day of hearing:

"This is a case in which we are called upon to determine the payment to be made by a railway company for the use under running powers of a portion of the line of another company. It makes the case a little complicated that the line of rails so used was adapted to the traffic of the running company at the expense partly of that company. Arbitration having been tried to no purpose, the two companies seem to have done wisely in referring the matter to our decision, under the Act which we have been appointed to administer. The claimants in the case are the Carmarthen & Cardigan Company. Their line is 19 miles long, and extends 55 chains, or nearly three-quarters of a mile, south of Carmarthen, to connect at the Myrtle-hill Junction with the South Wales section of the Great Western Railway Company. The other party to the case is the Central Wales & Carmarthen Junction Company. Their line of 13 miles in length joins the Carmarthen & Cardigan Railway at Abergwilly Junction, one mile and ten chains north of Carmarthen Junction, and the proper payment to be made by the Central Wales Company to the Carmarthen & Cardigan Company for the use of that station and of the one mile and ten chains of railway in the question for our decision. The line of the Central Wales at its other end, at the junction near Llandilo, connects with the system of the London & Northwestern Railway Company, who in fact work the Central Wales line for all traffic, through and local, and also run between Abergwilly and Carmarthen under the powers of the Central Wales Company. The line of the Central Wales was originally a branch, and was styled the Carmarthen Branch of the Llanelli Railway. In 1871 this branch and the Swansea Branch were severed from the undertaking of the Llanelli Company, and united into an independent line under the name of the Swansea & Carmarthen Railways. In 1873 this union was also dissolved, and the Carmarthen Branch has since existed separately as the line of the Central Wales & Carmarthen Junction Company. That company therefore occupy to the extent of their line the place formerly occupied by the Llanelli Company and the Swansea & Carmarthen Company successively; and when we speak in this judgment of the Central Wales Company we include in that term their predecessors during the periods of their successive occupation. We will first notice the claim of the Central Wales to have the terms of payment made specially easy to them, on the plea that under their Acts of Parliament they had the choice of two ways of going from Abergwilly Junction to Carmarthen, having either to use the existing line of the Carmarthen & Cardigan, subject to terms for the user, or to make a new and competitive line, and that in contending themselves with running powers and forbearing from the construction of a separate line they conferred a benefit upon the Carmarthen & Cardigan Company. In our opinion the manner in which the Central Wales exercised their statutory option tended as much to their own advantage as to that of the Carmarthen & Cardigan Company, and we do not consider that it would be just in calculating the terms of payment to have regard to the circumstance that there was this option or to the use that was made of it. We come next to a point which was put by the other side. In 1864 the Carmarthen & Cardigan was broad gauge, and therefore not adapted to the narrow-gauge rolling-stock of the Central Wales. According to the Act of that year the narrow-gauging of the portion of railway covered by the running powers was to be done by the Carmarthen & Cardigan Company at their own expense, or, if so agreed, by the Central Wales. It was actually done by the Central Wales Company, who expended a sum exceeding £5,000, partly on the line and partly on buildings and sidings at the Carmarthen station. The point put by the Carmarthen & Cardigan Company was that had the works been done at their own expense, they would have been entitled to an extra toll to recoup them that expense over and above the ordinary toll for the user of their line, and that the Central Wales should receive ample allowance for having relieved them that expense by undertaking it themselves if they should not be surcharged with an extra toll. Upon this point we dissent from the view of the Carmarthen & Cardigan Company. We think that what the Central Wales did at their own expense at a corresponding saving to the Carmarthen & Cardigan Company should be kept in view for a further purpose than that suggested, and that the amount even of the toll proper as it may be called, or ordinary toll, should be affected by it. We will now proceed to consider in what form and of what amount the payment to be awarded should be. It was suggested on behalf of the Central Wales that the cost of the portion of line and of the station being ascertained, they should pay interest on a specific proportion of such cost, and should then be regarded as joint owners, as it were, with the Carmarthen & Cardigan of that much of their property, and as having purchased the right to make any use of it that their traffic might require. We think it would scarcely be fair to the Carmarthen & Cardigan Company to take this course, and we prefer that they should be paid by tolls, and that the sums they receive should vary with the actual traffic from time to time. The principle of a fixed rent, however, seems to us not suited to one part of the case, and in the sum we have apportioned for the station it has been given a limited application. The ascertained cost of the station is £15,251. It was put at that figure by the engineers on both sides. We show in a separate paper the items composing the total. Interest upon that sum at 5 per cent. per annum for rent and 3 per cent. for maintenance and renewal amounts to £1,220; and we think the Central Wales should pay yearly two-sevenths of £1,220, or £348, the ratio of 2 to 7 being the same as the proportion which their use of the station bears to the total use made of it. We must, however, deduct from the sum of £348 £141 by way of interest at 5 per cent. on £2,823, which we find to have been expended by the Central Wales on works at the station, and thus we arrive at the sum of £207 as the net payment to be made yearly by the Central Wales to the Carmarthen & Cardigan for the rent, maintenance and renewal of the Carmarthen station. For the current station services, such as superintendence, portage, gas, rates, etc., we fix the Central Wales contribution at £50 for water. The three sums added together make the total annual payment of the Central Wales under the head of station and station services, £417. We will now state our conclusions regarding the toll to be paid for the one mile and ten chains of line. Much stress was laid in the course of the hearing upon the sums paid for services by the Great Western Railway Company to the Carmarthen & Cardigan, and by the

Central Wales to the Llanelli Company. Those cases do not bear a great resemblance to the present one, and they are not of use to us for precedents; but at best they could only show approximately what the payment should be, and, as it happens, the case we are dealing with has data of its own, from which every assistance for coming to a conclusion is to be had. The one mile and ten chains of line cost or are valued at £10,574 inclusive of the Central Wales outlay of £2,376 in narrow-gauging the line by the addition of a rail. Seven and a half per cent. upon this valuation—namely, 5 per cent. interest and 2½ per cent. for maintenance and renewal—would amount to £792, and if that sum were equally divided between the two companies in respect of their making an equal use of this portion of the line the share of each would be £396. But from the share of the Central Wales we must deduct 5 per cent. on £2,376, so that according to this test the sum payable by the Central Wales should be about £278 a year, the remainder of £396 after subtracting £118. We will take as another test the earnings of the Central Wales. In 1873 the total receipts of that company from all traffic, through as well as local, to and from Carmarthen, are £5,566. In this sum is included the haulage, under agreement, of the London & Northwestern Railway Company, whose charge varies from 15 to 25 per cent. according to the kind of traffic. In it is also included a sum of £1,366 for terminals, at the rates of the Clearing-house, and, as appears by the evidence and by the terms of the agreement, deducted prior to charging for haulage. In reference to this allowance for terminals, the Carmarthen & Cardigan made a claim to share in profits according to the Central Wales, from cartage done by them at the Carmarthen station, but we do not think there are any solid reasons for granting it. Haulage and terminals deducted, the line earnings of the Central Wales Company in 1873 from Carmarthen traffic could not have exceeded £3,360. If the local traffic were uniformly distributed over the run of 14 miles and 13 chains from Carmarthen to the Llanelli Junction, the average receipts per mile would be a clue to the proper payment for the one mile and ten chains of the Carmarthen & Cardigan line included in the longer distance. But as the local passenger traffic between Carmarthen and the two nearest stations of the Central Wales was not less than one-half of the whole local passenger traffic it would obviously not be fair to the Carmarthen & Cardigan Company to divide according to mileage, even to find the minimum sum that should be paid, and the value, therefore, of this particular test lies chiefly in enabling us to keep the toll in due proportion to the fund out of which it would come. It may, we think, be assumed that the local traffic of the Central Wales passing over the Carmarthen & Cardigan's portion of the line is at least double what it averages for an equal distance upon the Central Wales' own line, and upon a full review of the case and full consideration, we are of opinion that a toll would not be excessive in itself or out of proportion to the fund just mentioned which, upon a traffic equal to that in 1873, realized the sum of £470, out of which the Central Wales would retain £118 by way of interest at 5 per cent. on their expenditure of £2,376. In pursuance of this view, we have framed a table of rates, which, applied to the traffic of 1873, produces the sum of £470. It differs only from one of the tables put in during the hearing in the rate or toll per passenger, which we fix at twopence first and second class single, and at threepence return, and at one penny third class and parliamentary single, and one penny halfpenny return. Our other rates and tolls are the same as in the scale proposed by Mr. Broughton in his evidence. This table of rates is granted by us subject to revision on the demand of either company at any time during six months after the expiration of the first and every succeeding period of five years. We also intend that the rates and deductions, both for the station and for the line, shall apply as well to the past as to the future, and we order that any amount found due on the returns of traffic since December, 1867, shall be paid with interest at 5 per cent. per annum in the course of the next twelve months. We make no order as to costs."

Long Railway Runs.

It is a well understood proposition, and one generally accepted as true, that nothing operates more effectually to increase the time spent in accomplishing a given journey by rail than working trains on the short run system; and it is also true that so-called fast trains which stop frequently are the most expensive that it is possible to use. The reason for this last fact is obvious. Not only is much fuel wasted in doing work which is afterwards undone by the brakes in a way which we have already fully explained when dealing with the rolling stock of the Metropolitan Railway, but the speed of the train when running must of necessity be very high in order that the train may, in any sense, fulfil the condition of being "fast." But high speeds represent a great consumption of fuel, and augmented wear and tear of engines, carriages and road; and it will be found, as a result, that very few fast stopping trains are run by railway companies who understand in what true economy consists. Trains which stop at many stations in close proximity are essentially slow, no attempt being made to travel at a high velocity between the stations; and those who require conveyance over long distances select trains the average velocity of which, measured by the mile, is not very high—continuous running without a break getting the train over the ground in excellent time. As an example of the latter class of train we may take the Scotch mail on the Great Northern. This train accomplishes the whole distance between London and Edinburgh—about 400 miles—in nine hours and thirty minutes, the average speed being about forty-two miles an hour. It would be necessary to run this train at an enormously higher velocity if the stops were more numerous. As it is, we believe we are correct in stating that on no other line in the kingdom is a train to be found which gets over a greater distance in nine and a half hours. It is true that on the Great Western trains are run which accomplish 200 miles in about four hours and twenty minutes; but a run of 400 miles is not made on any line, save the Great Northern, in much less than ten hours. Long runs require very good engines and excellent rolling stock; but these being given, long runs are decidedly conducive to economy, and there is no reason why they should not be more freely adopted than is now the case on many important lines, and on all such lines the principle apparently might be extended with advantage. For example, there is apparently no good reason why the run from London to Liverpool, via Birkenhead, should not be accomplished without a stop, or at all events with but one stop, and in, say, four hours, the distance being, as nearly as may be, 200 miles. This road could not easily be made much better than it is, but the existing carriages would, for obvious reasons connected with the comfort of the public, not be suitable for such runs, and something in the nature of Pullman cars would be essential; at all events, free circulation through the train would be required. But this presents no difficulty. It is perhaps open to doubt whether a locomotive could be constructed which might be relied on to accomplish a journey of 200 miles in four hours without stopping, and the work would no doubt be exhausting to both driver and stoker. We have already expressed our opinions concerning the locomotives required for such work in a former impression, and we shall not further refer to the matter now, except to say that we believe it to be quite possible to construct engines which would be perfectly reliable, although they would, in some important matters of detail, differ from ordinary locomotives. The great difficulty to be contended with in working trains on such a long run is that under consideration lies in providing water enough. This would not stand in the way of the London & Northwestern

Company, who may use Ramsbottom's tanks, of which they have at present the monopoly. But it would be otherwise with the remaining English companies, who, precluded from using Ramsbottom's system, would be compelled to resort either to the use of tenders of unprecedented dimensions, or to some other device for filling up their tanks. There are grave objections to the use of large tenders, which would probably neutralize all the advantage to be gained from long continuous runs, but it is by no means certain that Ramsbottom's is the only arrangement by which a tender while in rapid motion can be replenished with water.

The idea of working trains between London and Liverpool direct resulted in nothing, although at one time it was stated, with some show of authority, that the directors were actually providing the requisite rolling stock, and on the Midland Railway trains no longer run without a stop to Leicester—a fact in some measure accounted for by the difficulty met with in providing water without the aid of the Ramsbottom trough. It may, from these circumstances, be argued that the long run system is already fully developed; but this we dispute. We have very little doubt that, on the contrary, as great towns, such as Liverpool, increase in size, it will become almost essential to establish a railway service between them and the metropolis so rapid and so heavy that it can only be dealt with by trains running directly from city to city without a stop. If, for example, Liverpool can provide a sufficient number of passengers to London at any given hour in the twenty-four to fully fill a train of, say, twelve coaches, it will be worth while to run that train through to London without a stop; and we feel certain that, if such a through train, properly constructed, were put on to-morrow, making the run, in say, four and a half hours, it would not only be the most popular train on the road, but also the train worked most economically. However opinions may differ in this country as to the value of the long run system, it is certain that our friends in the United States are determined to give the system a fair trial. Since 1st of June the Pennsylvania Railroad Company have commenced working long run trains between Pittsburgh, Philadelphia and New York. The distance is 444 miles, and the train stops on the road but three times—at Altoona for five minutes, after a continuous run of 117 miles from Pittsburgh; then comes a run of 132 miles to Harrisburg, where the train stops for twenty minutes for dinner; the next stage is to Philadelphia, 105 miles. The train stops here for five minutes, and then proceeds across New Jersey for 50 miles to New York. Nothing at all comparable to this work has ever before been done on a railway, except once or twice by special trains under exceptional circumstances. The run of 132 miles is no doubt a wonderful feat, and redounds not a little to the credit of American engineers. The entire line, we may state, is laid with 60 lb. steel rails, laid on oak sleepers and thoroughly well fished, the track being admirably ballasted. The train is made up of Pullman cars of the most luxurious description, and fitted throughout with the Westinghouse brake; the engines are supplied with water when running on Ramsbottom's system, and no pains appear to have been spared by the company to provide for the safety and comfort of the public.

As regards the velocity of this train, we learn from the published time-table that the train leaves Pittsburgh at 7:25 a.m., and reaches New York at 9:30 p.m. Deducting half an hour for stopping, we have as the total running time 14 hours 5 minutes, or say an average velocity of 31.7 miles an hour. Not a high speed certainly, but in no other part of the world is it easy, we believe, to accomplish a distance so great in the given number of hours. The first run of 117 miles is performed in four hours, or at the rate of 29.25 miles an hour; the next run of 132 miles is done in four hours, or at the rate of 33 miles an hour; the distance from Harrisburg to Philadelphia, 105 miles, is run in three hours and fifteen minutes, or at the rate of, say, 32.3 miles an hour; the final 90 miles across New Jersey being accomplished in two hours and fifty minutes, or about 32.1 miles an hour. We take it for granted that no great difficulty would be encountered in running the train at a higher speed, and performing the whole distance, say, in ten hours instead of fourteen, if it were worth while. As the facts stand, however, they prove that in America work is being done which deserves to be imitated in the old country, and its importance in a new and thinly populated country like the United States cannot easily be over estimated. We have no doubt that the possibility of running a locomotive continually and regularly for a distance of 132 miles will only give an additional stimulus to our American friends; and so, if we do not mind what we are about, we shall have some enterprising Yankee coming among us and bringing with him his own engines and cars, and running regularly from London to Liverpool in four hours, while we are debating whether it is possible to design an engine which can run for four hours without stopping and without a breakdown. Not the least remarkable feature in the working of the train to which we have referred is the circumstance that the engines make continuous runs of four hours without heating, or getting the tubes so choked up that they cannot keep steam. We commend the facts to the attention of our railway men.—*The Engineer.*

Circulars of Inquiry of the Master Mechanics' Association.

The following committee circulars have just been issued:

PURIFICATION OF FEED-WATER.

The committee appointed at the last convention of the American Railway Master Mechanics' Association to investigate the above subject, and ascertain the most approved methods for the treatment and improvement of feed water by chemical or mechanical means, and for the prevention of incrustation, beg your earnest consideration of the following questions:

1st. What means, if any, have you adopted for the improvement of feed-water for locomotive use?

2d. Can you suggest any method of depuration that would, in your opinion, improve the water on the line of your road?

3d. Do you recommend the use of rain and surface water, wherever it can be gathered in reservoirs or otherwise?

4th. Have you tried thoroughly any means to remove old formations, and to prevent the accumulation of new, and what would you advise?

5th. What "boiler compound," if any, do you recommend for the removal and prevention of incrustation?

The committee earnestly request the benefit of your experience in any experiment conducted by yourself or others under your observation, and all information upon this subject, given in detail, will be thankfully received and appreciated.

We especially request the contribution of specimens of incrustation for analysis, which please label with name of road, and mileage of engine in which they accumulated; also, please send, if possible, analyses of the water used in engines on your road, name of place from which it was taken, and its effects upon your boilers.

Respectfully,

H. A. TOWNE,

Northern Pacific and Lake Superior & Mississippi Railroads,
COLEMAN SELLERS, Philadelphia,
H. ELLIOTT,
Ohio & Mississippi Railway,
Wm. WILSON,
Chicago, Burlington & Quincy Railroad,
H. F. FARLES,
Atchison, Topeka & Santa Fe Railroad,
Committee.

Please address your reply (not later than February 15, 1875) to
H. A. TOWNE, St. Paul, Minn.

LOCOMOTIVE RETURNS, MARCH, 1874.

Master Mechanics of all American railroads are invited to send us their monthly reports for this table.

NAME OF ROAD.	Number of Locomotives in service.....	Number of miles open.....	Mileage.....	Ton of Coal.....	Cord of Wood.....	Pint of Oil.....	No. Miles run to	Cost per Mile in Cents for					Av'ge cost of Coal, per ton.....	Wood, per cord.....	
								Average No. of Freight Cars Hauled.....	Fuel.....	Repairs.....	Stores.....	Engineers, firemen and wipers.....	Total.....		
Atlantic & Great Western (First & Second Div.)...	228	80	213,013	38.18	.....	16.20	.....	5.50	7.48	0.56	0.88	6.34	20.76	\$2.69	\$3.92
" (Third & Fourth Div.)...	203	50	119,849	38.18	.....	15.47	.....	5.74	7.48	0.54	0.90	6.09	20.84	2.69	3.92
" (Moshon Division)...	113	60	120,307	38.18	.....	18.32	.....	5.58	7.48	0.48	0.62	6.11	18.27	2.69	3.92
" (Shenango & Allegheny)...	33	7	10,918	97.16	.....	23.08	.....	1.10	3.78	0.34	1.34	6.38	12.94	2.00	2.26
California Pacific.....	148	10	24,146	61.81	75.71	27.91	.....	6.54	12.62	0.48	0.61	6.81	26.45	8.25	9.00
Central Pacific (Western Division)...	173.4	40	97,362	47.69	.....	18.08	.....	11.61	16.38	0.73	0.31	8.37	37.49	7.32	4.83
" (Sacramento Division)...	119.5	41	94,841	30.45	15.59	.....	14.28	16.86	0.80	0.73	10.19	40.80	4.83	4.83	
" (Truckee Division)...	204.5	27	60,997	34.15	50.00	16.61	.....	5.98	19.64	0.74	0.77	8.62	35.62	7.32	4.83
" (Eureka Division)...	236.6	22	72,609	41.98	.....	14.80	.....	4.75	16.80	0.70	0.13	7.35	29.73	7.32	4.83
" (Salt Lake Division)...	182.8	22	68,431	37.86	.....	6.75	.....	2.51	11.64	0.57	0.57	7.84	22.66	4.83	4.83
" (Viola Division)...	151.48	7	19,866	41.47	22.00	.....	8.97	15.59	0.77	0.84	8.37	38.87	7.32	4.83	
Chicago, Burlington & Quincy.....	290	616	214,316	39.39	.....	15.36	19.18	7.15	7.23	0.55	0.89	8.29	23.22	2.70	4.00
Chicago, Rock Island & Pacific (Illinoian Div.)...	86	188	238	37.74	.....	16.11	.....	6.37	7.58	0.48	0.61	6.91	21.29	2.75	4.00
Cleve., Col., Cin. & Ind. (Columbus Div.)...	138	56	131,012	49.39	62.19	36.25	.....	4.36	8.12	0.55	0.68	6.88	19.11	2.75	4.00
" (Indiana Div.)...	207	66	187,792	47.21	46.71	26.14	.....	4.46	6.44	0.61	0.61	7.50	19.01	2.70	3.60
Cleveland & Pittsburgh.....	87	165,144	53.35	.....	16.30	.....	7.86	7.60	0.52	0.82	19.45	2.62	3.50	3.50	
Del., Lack., & West. (Bloomsburg Div.)...	80	22	50,115	35.07	.....	25.58	.....	6.07	5.97	0.83	0.33	6.90	2.90	1.90	1.90
Denver Pacific.....	6	16	120	48.99	.....	14.63	.....	7.06	6.92	0.46	0.68	6.83	21.27	3.50	3.95
Plut. & Marquette.....	86,687	22	49,600	24.47	.....	1.93	9.01	0.79	1.56	4.45	17.74	4.40	18.60	4.40	4.40
Illinoian Central (Chicago Division)...	262.5	63	137,268	38.21	.....	15.27	18.06	6.04	8.25	0.37	0.62	6.82	20.66	4.40	4.40
" (South Division)...	239,175	33	66,411	46.49	.....	12.61	17.92	6.99	5.43	0.36	0.64	6.92	19.62	1.90	4.43
" (North Division)...	225	42	97,322	32.15	.....	12.54	15.65	7.91	6.19	0.46	0.65	6.21	21.13	1.90	4.43
" (Iowa Division)...	401	40	99,518	33.71	.....	17.52	10.86	5.18	7.15	0.38	0.66	6.98	19.37	2.30	4.47
International & Great Northern.....	73,523	40	90,300	14.30	.....	3.30	7.50	0.90	0.40	8.40	20.10	3.30	3.30	3.30	3.30
Kansas Pacific.....	88	139,913	35.44	32.89	11.76	.....	6.04	10.81	0.52	0.68	6.79	24.16	3.75	4.13	
Kansas City, St. Joseph & Council Bluffs.....	22	60,397	36.30	.....	23.80	25,207	7.80	9.70	0.70	0.70	7.40	25.60	3.25	4.00	
Lake shore & Michigan South. Buffalo Div. *	91	165,194	45.61	45.61	14.44	.....	6.01	7.15	.....	0.58	7.81	18.97	3.50	3.50	
" (Eric Div. *)	113	156,937	45.16	45.16	14.44	30,533	5.88	7.71	.....	0.58	7.28	19.87	3.50	4.00	
" (Toledo Div. *)	79	170,539	36.60	51.27	13.73	20,927	5.77	10,26	.....	0.58	7.31	23.54	4.00	4.00	
" (Mich. South. Div. *)	208	436,375	11.49	50.93	20.92	.....	5.51	9.16	.....	0.58	6.76	16.57	4.00	5.00	
Leavenworth, Lawrence & Galveston.....	203.7	18	26,175	58.56	.....	3.49	.....	5.32	5.60	0.72	1.42	8.73	60.63	6.49	4.47
Marquette, Houghton & Ontonagon.....	10	14,397	62.85	.....	17.02	17.32	36.08	11.66	1.24	2.82	8.73	60.63	6.49	4.47	
Pennsylvania (New York Division)...	119.9	114	279,661	35.44	32.89	11.76	.....	4.20	15.60	1.20	2.00	0.19	7.10	.....	.....
" (Albany Division)...	182.2	66	112,890	47.88	45.66	12.95	.....	5.00	11.60	1.00	1.00	18.30	0.19	7.04	.....
" (Belvidere Division)...	84.6	38	70,232	39.20	45.67	10.68	.....	3.60	14.20	1.40	1.00	19.20	0.19	7.04	.....
" (Philadelphia Division)...	204.3	156	365,937	30.06	.....	14.12	.....	5.00	6.80	0.50	0.50	12.70	0.07	3.28	.....
" (Middle Division)...	131.6	132	316,999	26.14	.....	24.51	.....	6.00	7.70	0.70	0.70	14.40	0.07	3.28	.....
" (Pittsburgh Division, East End)...	90	139,729	19.77	11.06	.....	4.60	10.30	1.00	1.00	15.90	0.07	3.28	.....	.....
" (Pittsburgh Division, West End)...	117	249,668	30.27	14.12	.....	6.30	6.70	0.80	1.00	13.80	0.07	3.28	.....	.....
" (Tyrone Division)...	100.3	27	46,991	6.41	.....	27.03	.....	2.80	7.70	0.70	0.70	11.20	0.07	3.28	.....
" (West Pennsylvania Division)...	103.6	30	61,969	36.48	.....	27.62	.....	11.50	5.70	0.50	0.50	17.70	0.07	3.28	.....
" (Lewistown Division)...	62.5	8	12,757	14.21	.....	24.27	.....	3.60	4.80	0.60	0.60	9.00</			